Montana Fish, Wildlife and Parks
STATEWIDE
Integrated Noxious Weed Management Plan

FINAL DRAFT

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Montana Fish, Wildlife and Parks
Helena, Montana

Director, Montana Fish, Wildlife and Parks

Cover letter from Director Hagener will be added to final plan

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Montana Fish, Wildlife and Parks
Integrated Noxious Weed Management Plan

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INDEX TO ABBREVIATIONS AND ACRONYMS

ANS	Aquatic Nuisance Species
BMP	Best Management Practices
CIPM	Center for Invasive Plant Management
CWD	County Weed District
CWMA	Cooperative Weed Management Area
D&C	FWP Design and Construction Bureau
EA	Environmental Assessment
FAS	Fishing Access Sites
FHA	Federal Highway Administration
FTE	Full Time Employee
FWP	Montana Fish, Wildlife and Parks
GPS	Global Positioning System
IWM	Integrated Weed Management
MCA	Montana Codes Annotated
MDA	Montana Department of Agriculture
MOU	Memorandum of Understanding
MSU	Montana State University
MWCA	Montana Weed Control Association
NRIS	Natural Resource Information System
NWMAC	Noxious Weed Management Advisory Committee
NWTF	Noxious Weed Trust Fund
OHV	Off Highway Vehicle
Parks	State Parks
PSA	Public Service Announcement
RTP	Recreational Trails Program
SABHRS	Statewide Accounting and Budgeting Human Resource System
TEA	Transportation Equity Act
UM	University of Montana
WMA	Wildlife Management Areas

Chapter 1. Purpose and Need for Action

INTRODUCTION

Montana Fish, Wildlife, and Parks (FWP) administer about 364,626 acres of land within seven administrative regions across Montana (Figure 1). These lands encompass Wildlife Management Areas (85%), State Parks (9%), and Fishing Access Sites (5%), that provide for stewardship of plant, animal, and recreational resources in Montana. FWP currently manages invasive plant species on department owned and managed lands, and has identified noxious weeds as an important issue at the ecosystem level due to impacts on biodiversity, ecological processes, and recreation resources. A statewide strategy is needed to facilitate consistency in weed management activities across FWP Regions in Montana, reduce spread and abundance of weeds on FWP lands, and to protect and enhance diverse natural and recreational resources.

For purposes of this document, a weed is defined as any plant that interferes with management objectives for a given area of land (or body of water) at a given point in time. Once a plant has been classified as a weed, it attains a "noxious" status by rule as described in the County Weed Control Act (7-22-2101 (8)(a)(i), MCA). The Montana County Weed Control Act defines a "noxious weed" as any exotic plant species established or that may be introduced into the state which may render land unsuitable for agriculture, forestry, livestock, wildlife, or other beneficial uses and is further designated as either a state-wide or county-wide noxious weed.

Montana Fish, Wildlife and Parks are important members of a statewide partnership working to manage noxious weeds in Montana. This partnership includes County Weed Districts, Montana Department of Agriculture, Montana Weed Control Association (MWCA), and other stakeholders working together to develop criteria for managing weeds on FWP properties. FWP recognizes that objectives, expected results, and needs of each county may vary; however, their overall purpose and objectives will remain consistent throughout the state.

VISION

Montana Fish, Wildlife, and Parks' vision is to maintain long-term viability of Montana's natural and recreational resources, in part through responsible management of noxious and invasive weeds.

PURPOSE

The purpose of FWP Integrated Noxious Weed Management Plan is to guide ecologically based integrated weed management strategies on FWP managed lands that strengthen and support national, state, tribal, city, and county vegetation management objectives. This document was developed to meet state statute (7-22-2151, MCA) and improve consistency in weed management activities and priorities across FWP Regions. The Plan provides guidelines and direction to FWP for invasive plant management activities, while maintaining flexibility for local priorities and actions within FWP Regions.

OBJECTIVES

Objectives of this Integrated Noxious Weed Management Plan include:

1. Provide guidance and direction for implementing ecologically-based integrated weed management practices to enhance and protect FWP owned and managed lands.

2. Conserve terrestrial ecosystems by preventing introduction and establishment of noxious weeds on non-infested lands.

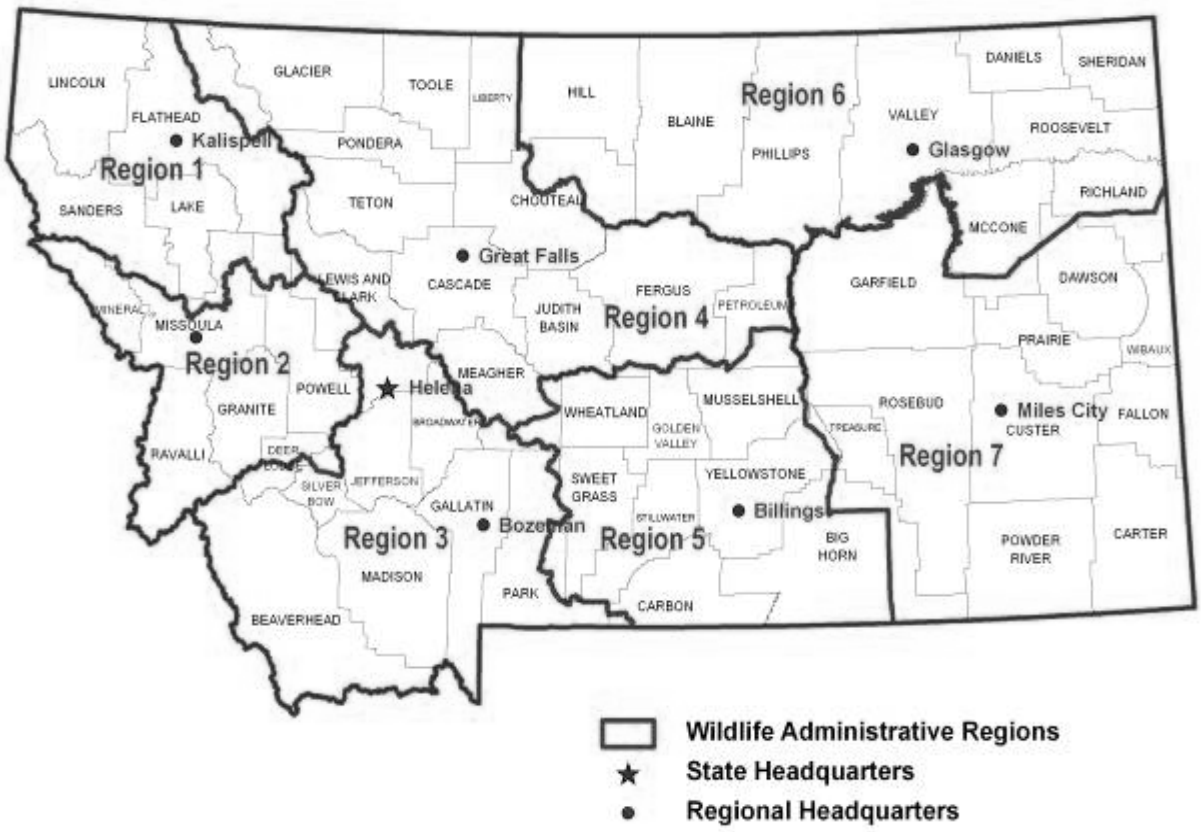
3. Reduce density and abundance of invasive plant infestations on FWP lands and prevent movement of noxious weed seed from high public use areas to other sites.

4. Prioritize sites for noxious weed management based on management objectives, and weed species, abundance, and location.

5. Provide guidance for noxious weed inventories on FWP owned and managed lands.

6. Strengthen FWP "good neighbor policy" by expanding weed management partnerships with public and private land managers.

Figure 1: Location of seven FWP administrative regions in Montana.



This Plan is a dynamic document that identifies specific objectives, issues, action items, and programs to enhance weed management efforts, provide uniformity across FWP Regions, foster coordination between FWP and other agencies/stakeholders, and increase public awareness about noxious weed issues. Expected results of the integrated noxious weed management program are identified within this Plan. Noxious and invasive plants in aquatic systems are addressed in the Montana Aquatic Nuisance Species (ANS) Management Plan on file with FWP.

NEED FOR ACTION

Noxious weeds and other invasive non-native plants have become well established in Montana over the past 150 years. These weeds have established and spread on FWP managed lands in addition to other public and private lands in the state. As of this publication, an estimated 32,650 acres of FWP managed lands are infested with noxious weeds.

The impact of weeds on biological communities is well documented. Weeds such as spotted knapweed (*Centaurea maculosa*) and leafy spurge (*Euphorbia esula*) have been shown to influence biological communities, including small and large mammal populations, by reducing forage, modifying habitat structure- such as changing grassland to a forb-dominated community, and changing species interactions within the ecosystem (Bedunah and Carpenter 1989; Belcher and Wilson 1989; Thompson 1996; Trammell and Butler 1995). Non-native plants also threaten biological diversity of native plant communities by displacing native species (Tyser and Key 1988) and can threaten the survival of rare and sensitive plants (Lesica 1991).

Ecosystem processes, including physical and chemical components of the environment, can also be altered by weed invasion. Annual grasses such as downy brome (*Bromus tectorum*), taprooted weeds such as spotted knapweed, and trees such as tamarisk/saltcedar (*Tamarix* spp.) are reported to have significant ecosystem impacts. Downy brome invasion has increased the frequency of fires from once every 60 to 110 years to once every 3 to 5 years on millions of acres of rangeland (Whisenant 1990) and resulted in elimination of native shrub communities (Randall, 1996). Studies have shown that replacement of native bunchgrasses with taproot weeds such as spotted knapweed can increase surface water runoff and soil erosion by 56% and 192% respectively (Lacey et al, 1989). Tamarisk increases fire frequency (Busch and Smith 1993), modifies hydrologic cycles by narrowing water channels (Friederici 1995), and changes soil chemical and physical properties (Storey and Thomson 1994). These large-scale modifications to the ecosystem have long-term impacts on the productive potential of the land, water quality and quantity in streams and rivers, and plant and animal resources.

Weeds also affect Montana's economy. Bioeconomic models were used to evaluate annual economic impact of knapweed and leafy spurge on grazing land and wildland values in Montana. Annual direct impacts of knapweed to grazing land value in Montana were $11 million, including lower personal income and lost cash outlays from reduced livestock production. Annual direct impacts to wildland values were $3.1 million, including $1.2 million for reduced wildlife associated recreation and $1.9 million for reduced soil and water conservation (Hirsch and Leitch 1996). Projections of total direct and secondary annual economic impacts exceeded $42 million in Montana, which could support 518 jobs in the state's economy. The economic impact of leafy spurge on Montana's economy was estimated at $18.6 million per year (Leitch et.al. 1994). These losses included reduced income from lower grazing capacity, lost livestock sales, and reduced grazing land and wildland values due to leafy spurge infestations.

The key to management of weeds is early detection and control to prevent spread into non-infested areas. High public use areas such as parks, fishing access sites, trails, administrative sites, and roads are high-risk sites for introduction of new weeds and contribute to spread of established noxious weeds. Preventing weed spread and protection of non-infested lands is critical to meet FWP vision.

PROPOSED ACTION

Montana Fish, Wildlife, and Parks propose modifying their current integrated noxious weed management program to improve consistency across FWP Regions and with The Montana Weed Management Plan (2008). Integrated Weed Management (IWM) is an ecological approach to managing weeds by combining various management methods, public education, and prevention in a way that enhances weed control and minimizes economic, health, and environmental risks. Weed treatments are discussed in this document that support and strengthen regional, state, and county directives as they apply to FWP lands. Environmental Assessments (EA) for specific weed management activities discussed within this Plan are available in FWP Regions.

Management of noxious weeds on FWP owned and managed lands will include six major components identified in the Montana Weed Management Plan. These components are: 1) public awareness and education; 2) prevention and early detection; 3) rapid response and management; 4) restoration and rehabilitation; 5) research and new technology; and 6) inventory, monitoring, and evaluation. Management techniques utilized may include manual, mechanical, chemical, cultural, and biological methods. Leadership for the program is identified within the document.

Expected results from each component of the management plan are described below. Action items addressing each of these components are described in Chapter 4.

Leadership: Provide statewide guidance to enhance, coordinate, and implement IWM projects on FWP owned or managed lands in Montana.

Prevention and Early Detection: Protect non-infested sites and reduce establishment and spread of newly invading weeds on FWP owned and/or managed lands.

Management: Implement effective IWM strategies to minimize seed production and expansion of noxious weed infestations within scope of existing EA.

Restoration and Rehabilitation: Decrease susceptibility of disturbed lands to noxious weed invasion and establishment.

Public Awareness and Education: Increase public awareness of noxious weeds in Montana and improve training for FWP employees on identification and management of state and county designated noxious weeds.

Research and New Technology: Support and partner with research involving noxious or invasive weeds (biology, ecology, management), and projects that will enhance desirable vegetation on FWP lands.

Inventory: Inventory and record locations of noxious weeds on FWP owned and managed lands.

Monitoring: Measure effectiveness of various programs components (management, public education, etc.) over time and compile information to develop effective management decisions.

Evaluation: Analyze integrated weed management program effectiveness.

Chapter 2. Overview of Invasive Plant Issues and Legislation

ISSUES AND LEGISLATION

Noxious weed management on state-owned or managed land in Montana must comply with existing laws and legislation. This section provides an overview of national, state, and county laws, legislation, and directives that will be incorporated into this Plan.

Federal Direction – Executive Order and National Invasive Species Management Plan

President Clinton issued Invasive Species Executive Order 13112 in 1999 calling on Executive Branch agencies to prevent and control introduction and spread of invasive species. The Order established the National Invasive Species Council, which is chaired by Secretaries of Agriculture, Commerce, and Interior and includes Departments of State, Treasury, Defense, Health and Human Services, Transportation, Environmental Protection Agency, and the U.S. Agency for International Development. The Order builds on the National Environmental Policy Act of 1969, the Federal Noxious Weed Act of 1974, and the Endangered Species Act of 1973 to prevent introduction of invasive species, provide for their control, and take measures to minimize economic, ecological, and human health impacts.

The National Invasive Species Council completed a National Invasive Species Management Plan in 2001. This Plan provides a blueprint for federal action for invasive species in coordination with international, state, local, and private programs.

State Direction – Montana Weed Laws

The first noxious weed legislation in Montana was passed in 1939. Since that time additional laws and rules have been enacted to strengthen weed management efforts. Laws currently affecting weed management in Montana are summarized below and can be viewed in their entirety at www.mt.gov or at http://data.opi.mt.gov/bills/mca_toc/index.htm

1. **Montana County Weed Control Act** (Title 7, Chapter 22 Part 21) provides for weed management activities at the county level. The sections on cooperative agreements with state agencies (7-22-2151) and requirements for weed management plans with public purchase or receipt of property (7-22-2154) are described in detail in Appendix C.

2. **Montana Weed Control Act** (Title 80, Chapter 7 Part 7) provides for technical assistance, embargoes, and rearing and distribution of biological weed control agents (80-7-720 MCA).

3. **Montana Noxious Weed Trust Fund Act** (Title 80, Chapter 7 Part 8) is a grant funding program designed to encourage local cooperative weed management programs, creative research in weed control, including the development of biological control methods, and educational programs. In FY2006 FWP received an education grant from this fund for $1612 for Hunters Against Weeds (community vehicle wash event). FWP was named a cooperator in 21% of Noxious Weed Trust Fund (NWTF) projects for the 2008 grant period.

4. **Montana Noxious Weed Seed Free Forage Act** (Title 80, Chapter 7 Part 9) establishes a certification program that provides for production of weed-seed-free forage and mulch. All forage products used by public utilities and local, county, state, or federal agencies, including but not limited to mulches, bedding materials, and erosion control barriers, must be certified as noxious weed seed free. All seeds used for reclamation purposes by public

utilities and local, county, state, or federal agencies must be free of noxious weed seeds and be certified seed according to Title 80, Chapter 5 (80-7-912 MCA).

5. **Montana Agricultural Seed Act** (Title 80, Chapter 5 Part 101-510) lists prohibited and restricted weed seed levels that must be maintained in state certified seed.

6. **Montana Commercial Feed Act** (Title 80, Chapter 9 Part 101-304) prohibits noxious weeds in commercial feed.

7. **Montana Environmental Policy Act (**Title 75, Chapter 1 Part 101-324) must be addressed by major state actions that have the potential for significant environmental impacts 75-1-201 1(1)(b)(iv).

8. **Montana Nursery Law** (Title 80, Chapter 7 Part 1) allows for inspection, certification, and embargo of all nursery stock for listed pests, including weeds.

State Direction – Other Laws and Programs

1. Senate Bill 326 (26) authorized FWP to provide up to 5% additional funds in addition to base payments to Block Management[1] cooperators (private landowners) who agree to use those payments for specific weed management activities on lands under their control. Block Management cooperators received about $184,613 for weed management on private land during the 2007 hunting season through this program. These funds are administered by FWP; however, there is no accounting procedure to determine number of weed acres treated with these dollars.

2. Sikes Act (Public Law 93-452) is federal legislation that allows for memoranda of understanding between state fish and wildlife agencies, the Forest Service and Bureau of Land Management to develop a funding source and establish cost-share projects for habitat restoration and improvement on public lands. From 2000 to 2007, weed management projects totaling $81,391 have been completed on national forest lands and one FWP Wildlife Management Area with Sikes Act funding.

3. Off-highway Vehicle (OHV) and Recreational Trails Program (RTP) funds administered by FWP are used, in part, for weed management activities including public education, inventory and control. These two funding programs provided $22,800 and $34,000 respectively toward weed management efforts on OHV roads and recreational trails on federal lands in 2005. The OHV grant program was established by legislature. Funding is from 1.9 of 1% of the Distributor's Gasoline License Tax, registration fees, dealer registration, and nonresident OHV permit fees. Recreational Trails Program was created by the Transportation Equity Act of the 21st Century (TEA21) which provided for the transfer of federal gas taxes paid on non-highway recreational fuel used in OHVs to the Federal Highway Administration (FHA). The FHA administers the program at the federal level, FWP at the state level.

[1]Block Management is a cooperative program between private landowners and FWP. The program helps landowners manage hunting activities and provides the public with free hunting access to private land, and sometimes to adjacent or isolated public lands. For the 2007 hunting season, approximately 1,250 landowners enrolled more than 8.5 million acres of land in the Block Management Program

State Direction – Montana Weed Management Plan

The Montana Weed Management Plan was updated in 2008 to provide a framework and recommendations for actions to prevent introduction and manage the spread of noxious weeds in Montana. The Plan was designed to incorporate existing Montana noxious weed laws and legislation, and to complement regional, national, and international strategies in the National Invasive Species Management Plan.

The Montana Weed Management Plan identifies the following needs for FWP:

1. Implement statewide inventory standards for mapping and monitoring weed infestations and weed management activities on FWP lands.

2. Incorporate weed inventory data into a statewide weed survey and tracking system.

3. Evaluate and prioritize current FWP noxious weed management practices and focus future efforts on high priority sites.

County Direction – County Weed Management Plans

County Weed Districts (CWD) implement and enforce the Montana County Weed Control Act. In addition, they also conduct weed education and awareness programs, develop cooperative agreements, coordinate weed management activities within and among counties, and monitor weed infestations on private and public lands. County Weed Management Plans provide guidelines for compliance with the Montana County Weed Control Act, Title 7, Chapter 22, Sections 7-22-2101 through 7-22-2153, MCA, and provides a framework for effective noxious weed management [Online: http://data.opi.mt.gov/bills/mca_toc/7_22_21.htm].

In compliance with 7-22-2151, MCA (Appendix C) the Montana Fish, Wildlife and Parks is required by state statute to develop a noxious weed management plan and to have the plan approved by County Weed Boards as well as providing a biennial report on weed management activities.

The County Weed District may provide assistance to FWP in:

1. Training FWP employees on various weed management activities (weed identification, weed management techniques, monitoring, and other related activities)

2. Developing annual work plans for management of noxious weeds.

3. Maintaining written agreements specifying the mutual responsibilities of the weed district and FWP for implementing an integrated noxious weed management plan.

4. Coordinating noxious weed management programs with private Cooperative Weed Management Areas (CWMA) and other local, state, tribal, and federal entities.

5. Developing educational programs about noxious weeds for agency personnel and the general public.

6. Obtaining biological weed control agents and monitoring their establishment.

Construction Sites and Reclamation of disturbed rights-of-way (Montana Weed Management Plan)

Section 7-22-2152, MCA of the Montana County Weed Control Act requires any person or agency disturbing vegetation by construction in the weed district to submit a revegetation plan to the Weed Board

for board approval. The plan must provide for the establishment of beneficial vegetation in the disturbed area after construction is completed. FWP must allow county weed boards to review and comment on reclamation specification for construction projects that cause significant ground disturbance.

WEED LISTS AND CATEGORIES

As of March, 2008, there are 32 designated noxious weeds in Montana that are divided into four categories based on number of acres infested in the state and management criteria. This unique classification system is modified and updated as needed by the Statewide Noxious Weed List Advisory Committee, and determined by Rule of the Montana Department of Agriculture (MDA) under the provisions of the Montana County Weed Control Act. The Committee uses established criteria to review requests for additions to the list. Recommendations from the Committee are made to Director of the MDA. Weeds on federal and regional weed lists are reviewed for inclusion on the Montana state list based on their potential to invade and spread within the state. Detailed information regarding Montana weed listing criteria are described in The Montana Weed Management Plan. Common and scientific names of Montana's noxious weeds and acres infested statewide are described in Appendix A.

In addition, weed districts may include weeds specific to their counties (Appendix B). FWP will recognize management of both county and state-listed noxious weeds for management. In most cases, state-listed noxious weeds will have priority over county-designated species. Native vegetation that may be listed on a county weed list will not be controlled by FWP.

Category 1 includes 15 noxious weeds infesting about 6.9 million acres of Montana. These weeds, such as spotted knapweed and leafy spurge, are generally widespread in the state. They are well adapted to a wide range of site conditions, and render land unfit or greatly limit beneficial uses.

Category 2 includes ten noxious weeds infesting about 500,000 acres statewide. These weeds have recently been introduced into the state or are rapidly spreading from their current infestations. Weeds within this category, such as rush skeletonweed, tansy ragwort, and tamarisk are capable of rapid spread and invasion of lands. Category 2 weeds have a high priority for management.

Category 3 includes six noxious weeds: yellow starthistle, common crupina, dyers woad, Eurasian watermilfoil, flowering rush, and the knotweed complex. These weeds have either not been detected in the state or may be found in small, scattered, localized infestations. As of 2007, there were about 800 acres infested with flowering rush, 200 acres of knotweed, and 154 acres of dyers woad reported in Montana. Eurasian watermilfoil was reported in the state in 2007 and is estimated to infest more than 200 acres. Management criteria include public awareness and education, early detection, and immediate action to eradicate infestations.

Category 4 includes scotch broom. Weeds within this category include plants that are invasive and may cause significant economic or environmental impacts if allowed to become established in Montana. Research and monitoring for Category 4 plant species may result in their listing as a Category 1, 2, or 3 noxious weed in Montana. Plant species designated as a Category 4 plant are prohibited from sale within or into Montana.

Chapter 3. Existing Situation and Current Program

EXISTING SITUATION

Affected Area

Montana Fish, Wildlife, and Parks own, lease, or manage about 517 sites in Montana that comprise 364,626 acres. Lands include 312 fishing access sites, 50 state parks, 109 wildlife management areas, and more than 40 administrative sites including fish hatcheries. These lands have diverse vegetation including turf and ornamental plantings, cropland, and native riparian, grassland, and woodland habitat types. Many of the sites are highly susceptible to noxious weed invasion due to human and natural disturbance, and proximity to roads and/or waterways.

Fishing Access Sites (FAS) and similar sites, comprise 18,825 acres and are dedicated to providing public access to streams, lakes, and reservoirs in Montana. Sites range in size from less than 1 acre to about 3000 acres with 62% under 25 acres in size. There are 35 sites (11%) that encompass 100 or more acres. These sites are accessed by gravel or paved roads that end in a parking area. Fishing access sites are characterized by high public use and include boat ramps or other access to surface water. Riparian vegetation, high water tables, and surface water are present throughout much of the site. Vegetation management objectives include establishing weed-resistant, low maintenance vegetation on roadsides and high public use zones, and protecting and enhancing native riparian vegetation along water, and in areas where public use is dispersed.

State Parks (Parks) and affiliated sites comprise 34,898 acres in Montana and were developed to preserve, enhance, and provide interpretation for Montana's natural, cultural/historic, and recreational resources. Parks range in size from less than 1 acre to 11,602 acres, with 27 (54%) sites greater than 100 acres. Parks are generally characterized by high public use, and are accessed by either improved gravel or paved roads. They may include a visitor center, other public and administrative buildings, irrigated turf and ornamentals, picnicking areas, camping, and relatively large areas of native vegetation. Public use is concentrated in areas of campgrounds and the visitor center, with more dispersed use within native grasslands, riparian areas and forests. Vegetation management objectives include maintaining turf and ornamental and/or native species around visitor centers; establishing weed-resistant, low maintenance vegetation on roadsides, campgrounds, and picnic areas; and enhancing and protecting native vegetation in areas where public use is dispersed.

Wildlife Management Area (WMA) and affiliated sites comprise 310,904 acres or 85% of land owned/managed by FWP. The goal of a WMA is to maintain critical wildlife habitat for conservation of species and enjoyment of the public. These areas range in size from less than 3 acres to 56,500 acres with 36 (33%) of WMA greater than 1000 acres in size. They encompass a variety of habitat types including riparian corridors, cropland, native grassland, and/or forest habitat types. Public access is generally by gravel or improved roads, with public use concentrated in the parking zone and dispersed throughout the remainder of the WMA. Vegetation management objectives are to enhance and protect desirable vegetation to promote healthy populations of game and non-game wildlife.

Administrative Sites and Fish Hatcheries comprise 40 separate sites. These sites are accessed by paved roads and may include bare ground for equipment and supply storage, structures, and managed grounds (turf). Vegetation management objectives include maintaining vegetative cover to reduce establishment of weeds and other undesirable vegetation, and providing pleasant surroundings for staff and the public.

Weed Species, Location, and Acreage

Infested acres in this report are estimates by field staff, and represent the amount of land that would have to be treated to control populations of noxious weeds at a given location. For example, an entire acre may have to be treated even if weeds are relatively scattered. Approximately 9% (32,650 acres) of lands owned or managed by FWP are infested with noxious weeds (Table 3-1). The percent of land infested by noxious weeds is greatest on FAS (14%), followed by WMA (9%), and lowest in Parks (4%). Regions located in the western portion of Montana have the highest levels of weed infestations. Spotted knapweed and leafy spurge are the most widespread weeds reported on FWP lands; however, most Category 1 and 2 state-listed noxious weeds are reported to occur on FWP lands. Weed lists and categories are described in Chapter 2 and shown in Appendix A and B.

Table 3-1. Total acres and estimated weed infested acres in each site type by Region in 2007.

Region	Fishing Access Sites		State Parks		Wildlife Mgt Areas		Total Infested	
	Total Ac	*Infested*	*Total Ac*	*Infested*	*Total Ac*	*Infested*	*Acres Infested*	*%*
1	3654	178	3032	18	10048	1401	1597	9.5
2	4048	781	934	80	34138	12144	13005	33.2
3	5723	527	5995	539	151257	14500	15566	8.8
4	1022	112	7254	332	98296	188	632	0.5
5	2485	869	875	239	4022	115	1223	16.5
6	719	61	591	1	9725	51	113	1.2
7	1174	79	16217	106	3418	329	514	2.5
Total	**18,825**	**2607**	**34,898**	**1315**	**310,904**	**28,728**	**32650**	**8.9**
% Total		**(13.8%)**		**(3.9%)**		**(9.2%)**	**(8.7%)**	

CURRENT PROGRAM

Montana Fish, Wildlife, and Parks currently utilize an integrated approach for managing noxious weeds. Regions have completed Environmental Assessments for current weed management activities on FWP lands. The EA cover weed management methods and practices included within this Plan. The following section describes each management method and how the method is currently implemented by FWP.

Leadership

Montana Fish, Wildlife and Parks Regional Supervisors are responsible for implementing the weed program in each Region. Noxious weed management is primarily the responsibility of three divisions within FWP. The Field Services Division coordinates statewide weed management activities through the Landowner/ Wildlife Resource Specialist position. This position budgets 10% of time and operating expenses to weed management programs and issues. However, an average of 25 to 30% of this position has been required annually to meet FWP weed management program needs since 2004. On-ground weed management of FWP owned and/or managed land is primarily the responsibility of Parks and Wildlife Divisions. The Parks Division is responsible for weed management on Parks and FAS. The FWP Management Division and Fisheries Division are responsible for weed management on administrative sites and hatcheries respectively. The Wildlife Division is responsible for weed management on WMA. Oversight and leadership for on-ground weed management efforts at the Regional level are delegated to FWP employees by Regional Supervisors.

A Noxious Weed Management Advisory Committee (NWMAC) was formed in 2006 to provide interdisciplinary coordination and review for noxious weed management on Department owned and

managed lands. The Field Services Division provides coordination and support for the NWMAC. Members represent each Region in addition to Wildlife, Parks, and Communication and Education Divisions.

Other Divisions and Bureaus that provide input to FWP weed management program include the following:

- Communication and Education Division: This Division does not have a budget dedicated to noxious weeds but is responsible for conducting public awareness and education programs that involve weed identification and/or management (some volunteer hunter education instructors provided education on noxious weeds).

- Enforcement Division: Wardens perform some noxious weed control activities such as hand-pulling weeds in remote natural areas, but the Division has no enforcement capabilities for weed laws (i.e. weed seed free forage requirements on public lands).

- Field Services Division:

  - Design and Construction Bureau (D&C): The D&C Bureau is responsible for the design and construction of capital projects and incorporates use of best management practices (BMP) to reduce spread of noxious weeds onto or from disturbed sites. This includes use of weed-seed-free mulches and erosion control materials, and requiring contractors to clean equipment prior to entering and leaving a construction site. The D&C Bureau will utilize guidelines developed by Goodwin et al. (2006) and Jabcobs et al. (1998) for restoration and reclamation of disturbed sites.

  - Lands Unit: Ensures that properties proposed for purchase or acquisition are inventoried for noxious weeds prior to acquisition and if necessary, a weed management plan developed with the County Weed District.

  - Hunter Access Enhancement Programs (Block Management): Provides revenue, including a 5% Weed Incentive Payment, to landowners involved in Block Management. There is no accounting procedure to measure acres of noxious weeds treated with this revenue. In 2007, there were about 1200 landowners that received weed payments totaling $184,613.

- Fisheries Division: Future Fisheries Projects are granted through this Division to restore/rehabilitate streams on private lands in Montana. Agreements to maintain projects are made between FWP and private landowners for a period of up to 20 years. If weeds are identified on site during the 20 year monitoring period, FWP will notify the private landowner. Although weed control is the responsibility of the landowner, FWP can assist with locating weed infestations and providing guidance for implementing control measurers.

Prevention

Sites that receive high public use such as parking areas, developed campgrounds, trail heads, and areas along roads and water courses are major sites for introduction and spread of noxious weeds. Thus, prevention, early detection of newly invading species, and implementing rapid control measures are critical to supporting county and state weed management objectives.

Fish, Wildlife and Parks has not adopted statewide weed prevention methods across Divisions (Wildlife, Parks, and Fisheries) or among various site types (WMA, Parks, and FAS). For example, prevention strategies requiring use of weed seed-free construction materials and animal feed, department vehicle and equipment

washing, and early detection and treatment of new invading weed species have been implemented only on specific properties within some Regions. In another example, vehicular travel is highly restricted and monitored on most State Parks. Although vehicles are also highly restricted on FAS and WMAs, these sites are difficult to adequately monitor with current staff.. There is also inconsistency regarding pre and post construction weed mitigation measures within specifications managed by FWP Design and Construction Bureau. Follow-up and subsequent actions on construction contracts are in-part the responsibility of regional department personnel and are not consistently applied across the state.

The Aquatic Nuisance Species (ANS) program has implemented boat inspections at checkpoints and provide power washing for boats at some locations to minimize movement of non-indigenous aquatic species including Eurasian watermilfoil and flowering rush. In addition, an annual statewide inventory for Eurasian watermilfoil is conducted on water bodies in Montana. These prevention efforts are targeted toward major recreational sites on lakes and rivers. In July 2007, the ANS inspection team found the first known infestation of Eurasian watermilfoil in Montana at Noxon Reservoir (Sanders County). There are insufficient funds to establish check stations and conduct inventories at all lakes and rivers in the state.

Management

Management of noxious weeds on FWP owned and managed land integrates mechanical methods, biological control, herbicides, grazing animals, and cultural methods. Table 3-2 shows number of acres treated by various weed management methods on the three major FWP site types. There were 7719 acres reported as treated in 2007; however, this number reflects acres treated by each treatment method. Individual infestations of noxious weeds may be treated with more than one treatment method (i.e. mowing plus herbicides; grazing plus herbicides), or receive multiple applications with one method. Thus total treated acres in less than 7719. Continued introduction, establishment and spread of noxious weeds require additional inventory, monitoring, and control efforts to eliminate new infestations and contain/reduce existing infestations.

Table 3-2. Acres treated by various management methods on FWP lands in 2007.

Management Method	Fishing Access Sites	State Parks	Wildlife Mgt Areas	Total Treated Acres
	Acres Treated	*Acres Treated*	*Acres Treated*	
Mechanical control (mowing/cultivation)	250	312	446	1008
Grazing Animals	486	0	500	986
Herbicides	890	486	4349	5725
Biological Control [1] (releases)	(>21)	(7)	(>769)	(>797 releases)
Total Acres	**1626**	**798**	**5295**	**7719**

[1] Note: There were no acres calculated as "treated" for biological control since this figure is unknown. However, biological control agents have reduced acreage and density of St. Johnswort, Dalmatian toadflax, leafy spurge and spotted/diffuse knapweed at some locations.

The FWP is an active partner in cooperative weed management efforts with County Weed Districts (CWD), and public and private land mangers. Noxious weed management on FWP owned lands is accomplished through a combination of CWD and private contracts, and internally by FWP employees.

The FWP also manages funding sources for weed management on private and federal lands through special grants and the Block Management Program. These programs are explained in more detail in Chapter 2 Legislation/Programs (pg. 2-2) and under "funding" (pg. 3-12). Management methods and

acres of noxious weeds treated are not recorded on lands other than those owned or directly managed by FWP.

Mechanical and Manual Control

Mechanical control includes use of mowing, weed whips, and cultivation equipment. Mowing as a noxious weed management tool must be timed to have the greatest impact on target weeds while minimizing impacts to desirable vegetation. For example, spotted knapweed seed production can be significantly reduced by a single mowing at late bud to early bloom growth stage (Watson and Renney 1974.). If mowed earlier, beneficial plants are negatively impacted and spotted knapweed is able to re-grow and may produce more seed than non-mowed plants.

Mowing and cutting are important components of FWP vegetation maintenance program. In general, the current FWP mowing program is based on needs for aesthetics, site function (improved access and parking), and safety (roadsides) rather than as a weed management tool. There are limited areas where mowing events are timed to have the maximum impact on target weeds, or used to remove vegetation as a set-up treatment for herbicide application. There is a need to adopt mowing guidelines on non-turf grass sites that will enhance noxious weed management.

Cultivation (tilling) includes uses of farm equipment to remove existing vegetation and prepare a seedbed for crops or restoration of a site to more desirable species. Tilling is effective against annuals and some tap-rooted perennials depending on timing of tillage operations. Small root fragments from perennials with rhizomes such as leafy spurge, Russian knapweed, and Canada thistle, can resprout following tillage. Cultivation has been used in several Regions for improving or increasing forage for wildlife and as a weed management tool.

Manual control (pulling or digging plants) can be effective on small infestations of annual and tap-rooted weeds. Pulling or digging is generally not effective against most rhyzomatous perennial weeds such as leafy spurge and Canada thistle, since deep underground stems and roots can re-sprout. Manual control is utilized by Regions statewide to control small isolated infestations of noxious weeds.

Mulching as a weed management tool can be used on relatively small areas, but can stunt or stop growth of desirable species if applied more than several inches thick (Appendix I). Mulching cannot control most rhizomatous perennial weeds because extensive carbohydrate reserves allow them to grow through or around the mulch. Mulching as a ground cover to reduce erosion and enhance seedling establishment is currently used as part of some restoration projects on FWP lands.

Cultural Methods

Cultural weed management methods enhance growth of desired vegetation and help slow weed invasion. The use of irrigation, fertilization, plant competition, smother crops, fire, domestic livestock grazing, and weed life cycle disruption are methods that will impact noxious weeds. On undeveloped or natural areas, maintaining native or desirable vegetation in a healthy condition and minimizing soil disturbance are beneficial for slowing spread of noxious weeds.

Irrigation can be used to manage some weeds; however, its application on wildland sites (WMA and some FAS) is limited. Irrigation in parks, administration sites, and hatcheries can be used to help establish vigorous stands of desirable plants quickly on disturbed areas, providing increased competition for invasive plants. Irrigation on FWP lands is currently used to maintain aesthetic value of non-native turf and ornamentals surrounding administrative sites and parks, or to improve production on cropland.

Use of fertilizer as a weed management tool will cause most noxious weeds to become more vigorous. Fertilizer in combination with reseeding or other restoration techniques may increase vigor of desirable plants and make non-infested sites more resistant to weed invasion. Fertilizers are currently used by FWP on some cropland sites and for turf management around administrative sites and parks.

Fire is a natural process that can help maintain or improve health and productivity of native plant communities. However, fire may also open niches that enhance establishment and spread of invasive non-native plants. For example, spotted knapweed is known to increase in density following wildfire events (Sheley et al. 1999). Prescribed fire is used occasionally on FWP lands to stimulate desirable vegetation and as a setup treatment for mechanical or herbicide application.

Livestock Grazing

Montana Fish, Wildlife and Parks support livestock grazing practices that improve overall range health, reducing susceptibility of sites to weed establishment and spread. Historically FWP has either removed livestock from over-grazed lands or implemented rest-rotation grazing on WMA throughout the state (Table 3-3). The intent of implementing a specialized grazing management system was to improve range condition and health, increase competitive ability of desirable vegetation, and enhance wildlife habitat.

In addition to implementing rest-rotation grazing systems, FWP also utilizes sheep and goats in targeted (prescribed) grazing for noxious weed management (Table 3-3). Targeted grazing is the application of domestic livestock grazing at a specified season and intensity to accomplish specific vegetation management goals. Targeted grazing is a relatively new addition to the invasive plant management toolbox and research related to impacts of grazing on various invasive plant species and associated desirable plant communities is on-going. Implementation of targeted grazing must consider compatibility of grazing with the habitat, land management goals, weed species, weed infestation characteristics, livestock needs, and resources available to implement the program successfully. Targeted grazing by domestic sheep or goats will not occur on FWP managed lands within 10 miles of occupied bighorn sheep habitat to minimize disease transmission from domestic to wild sheep.

Table 3-3: Number of FWP owned or managed acres that are under a rest rotation grazing system to enhance desirable vegetation, and acres under targeted livestock grazing for noxious weed control (2007).

Region	**Fishing Access Sites**		**State Parks**		**Wildlife Management Areas**		
	Total Ac	*Acres in Targeted Grazing*	*Total Ac*	*Acres in Targeted Grazing*	*Total Ac*	*Rest Rotation*	*Acres in Targeted Grazing*
1	3654	0	3032	0	10048	3283	0
2	4048	0	934	0	34138	0	0
3	5723	220	5995	0	151257	58435	500
4	1022	0	7254	0	98296	23698	0
5	2485	266	875	0	4022	0	0
6	719	0	591	0	9725	2987	0
7	1174	0	16217	0	3418	330	0
Total	**18,825**	**486**	**34,898**	**0**	**310,904**	**88,734**	**500**

The use of livestock as a vegetation management tool is often combined with other management methods, such as herbicides or biological control agents, to more effectively contain and reduce weed infestations. Minimum standards for grazing on FWP lands are described in Appendix G and apply with few exceptions to both rest rotation grazing and targeted grazing of livestock. In specific instances where noxious weed infestations have significantly reduced and degraded range productivity to a point where range recovery goals cannot be met under the minimum standards, a more aggressive targeted grazing scenario may be needed. A return to the minimum standards must occur as soon as noxious weed densities have been reduced to a level where range health and habitat value have been reestablished.

Biological Control (insects, pathogens)

Biocontrol involves the use of living organisms, such as insects or pathogens, to recreate a balance of weed species with predators. When successful, this management tool provides essentially permanent, widespread reduction in target noxious weeds with a very favorable cost-benefit ratio.

Biocontrol agents are introduced from the country where the host weed originated. These agents are extensively tested to ensure that they have a very narrow host range. The testing process for a biocontrol agent is typically three to four years in duration and involves 50 to 75 test plant species with final approval by USDA, Animal Plant Health Inspection Service. Although extensive screening and testing reduces the potential for injury to native plants, biocontrol is not risk-free (Story pers. comm.). Once established, biocontrol agents may persist "forever" which is liability if the agent attacks desirable species (Pemberton 1985; Lockwood 2000; McEvoy and Coombs 2000).

The FWP and County Weed Boards have been actively involved with biological methods of managing weeds since 1980. Cooperative projects to establish biological control agents (insects and pathogens) included FWP, County Weed Districts, Montana State University (MSU), and federal agencies. As of this writing, there have been more than 790 documented releases of biological control agents on noxious weeds on FWP lands across Montana. The leafy spurge flea beetle (*Aphthona* sp.) is an example of a well established biocontrol agent that is impacting leafy spurge on FWP sites. These efforts need to be expanded especially along riparian areas and sites where other management options are limited.

Herbicides

The FWP uses herbicides as part of their current integrated noxious weed management program. Herbicides are applied by county or private contractors, and/or FWP employees licensed by the Montana Department of Agriculture (MDA). At the time of this publication, there were 27 applicators and 21 operators licensed by MDA for herbicide application on FWP sites. Properly used, herbicides are effective against most noxious weeds. Variation in effectiveness occurs due to weed biology, plant growth stage, application rates, condition of the application equipment, and environmental conditions such as temperature, soil moisture, and precipitation.

Herbicides currently used on FWP lands have been registered for use by EPA. These herbicides are carefully tested by the manufacturer to determine human health, safety, and environmental effects prior to registration. Herbicides applied on FWP lands include picloram (Tordon 22K®), aminopyralid (Milestone® and ForeFront R&P®), dicamba, 2,4-D, clopyralid (Transline/Curtail/Redeem®), triclopyr (Garlon/Redeem®), fluroxypyr (Vista®), metsulfuron (Escort/ Cimarron®), imazapic (Plateau/ Journey®), chlorsulfuron (Telar®), imazapyr (Arsenal/Habitat®), and glyphosate (Rodeo/Roundup® and others). With the exception of glyphosate, imazapyr, and imazapic, these herbicides are selective for broadleaf weeds and do not cause injury to grasses. Herbicides are selected for application based on the target weed, safety to desirable non-target vegetation, and environmental conditions present at the site. For example, clopyralid will provide excellent control of knapweed in open-canopy coniferous forests

without causing injury to conifers. Herbicide application equipment includes backpack-type and vehicle-mounted sprayers. There is contract aerial application of herbicides for noxious weed control on some WMA and state parks that have extensive weed infestations and/or infestations located on steep terrain that is difficult to access by other methods. Application of herbicides by aerial methods on FWP lands must be covered under an EA (i.e. Lewis and Clark Caverns State Park).

Fish, Wildlife and Parks recognizes the importance of controlling noxious weed spread and weed invasion in riparian and aquatic systems. However, research indicates that some aquatic herbicides are lethal to certain species of amphibians. In the event that amphibian populations are determined to be impacted or at risk due to use of aquatic herbicides, such herbicide use will not be permitted on FWP properties.

Contracted Noxious Weed Management

Weed management activities involving the use of herbicides are contracted on the majority of FAS and Parks owned and managed by FWP. Biological control with insects, mechanical/manual control, and grazing animals is also contracted to on a limited basis to either County Weed Districts (CWD) or private contractors. County Weed Districts are the primary contracting partner with FWP and are frequently the most cost-effective method of weed control. Representatives with FWP meet annually or bi-annually with CWD to establish an annual plan of operation based on budgets and priority areas for treatment. Contracts are written between counties and FWP on an annual or biennial basis.

Restoration/Reclamation/Revegetation

The terms restoration, reclamation, and revegetation are often confused, and for the purpose of this document are defined as follows: *Restoration* is a return of something to an original or unimpaired condition. An example of restoration is establishing previously existing native plants to highly disturbed or degraded sites. *Reclamation* is the reclaiming of degraded lands to productive or desired use. Reclamation attempts to restore *some* elements of structure and function in an ecosystem. It is considered less ambitious but sometimes more feasible than restoration and can include both native and desirable non-native species. *Revegetation* is to cause desirable vegetation to grow again.

Establishing desirable vegetation on highly disturbed and/or degraded sites should be an important component of an invasive plant management program. Desirable plants that are adapted to site conditions may need to be restored on disturbed areas or sites where invasive plants are controlled. Disturbed areas, where restoration projects may protect critical habitat or important natural features, should have the highest priority. Areas where restoration or reclamation has a good chance of success should also be a high priority. Restoring or reclaiming sites to desirable plant communities will ultimately reduce costs associated with invasive plant management.

Revegetation may not be necessary to restore a desired plant community. For example, if a moderately healthy component of desired vegetation remains on the site, restoration may be achieved through other management techniques such as implementing specialized livestock grazing systems, herbicide applications, and/or the integration of these techniques. Before revegetation occurs, sites should be evaluated for the presence and composition of desired species. Monitoring is required following revegetation to determine survival of desirable species.

The FWP Design and Construction Bureau will utilize guidelines developed by Goodwin et al. (2006) and Jabcobs et al. (1998) for restoration and reclamation of disturbed sites (including reclaiming/restoring vegetation in fire camps). Construction standards include requirements for weed-free seed, mulch, and construction equipment cleaning. Annual monitoring of sites to determine success of restoration projects is the responsibility of area managers. As of this writing, the majority of

restoration and restoration projects are conducted as part of post-construction projects under the administration of the Design and Construction Bureau. There is the need to evaluate and monitor sites treated for noxious weeds to determine whether revegetation is required.

Inventory and Monitoring

Inventory, monitoring, and evaluation are critical components of a weed management plan. Inventory of existing weed infestations is necessary to identify newly invading species, develop long-term management goals and objectives, implement action plans, and evaluate the status of weed management efforts. Monitoring is used to measure effectiveness of various programs over time and compile data to improve management decisions.

Inventory: There is some level of inventory for weeds conducted by FWP Regions statewide. Survey techniques include identifying weed infestations as part of annual work plans, marking weeds on hand-held maps, and use of global positioning systems (GPS) to accurately inventory weeds. Montana Mapping Standards are used to record weed inventory data in two Regions. Estimates on accuracy of inventory methods ranges from 75 to 100% across Regions. Inventory data is either stored within the Region, or sent to counties. The Montana Weed Management Plan identified the need for FWP to implement statewide inventory standards for surveying noxious weed populations on FWP lands, and incorporate this data into a statewide system. As of this writing, a new statewide weed survey data storage and retrieval system is being developed with input from FWP.

An annual statewide inventory for Eurasian watermilfoil is conducted on lakes in Montana through the Aquatic Nuisance Species Program managed by FWP. Survey and monitoring of riparian areas for non-indigenous species through the ANS program includes incidental reporting of noxious weeds such as tamarisk, purple loosestrife, and other weeds associated with riparian areas. Due to budget constraints, it is possible to inventory only a small percentage of riparian corridors for noxious weeds through the ANS program.

Monitoring: Monitoring is necessary to establish baseline data on site condition, and record changes in vegetation trends before and after implementing weed management practices. Level of monitoring will vary based on resources and manpower available. An intern has been hired annually since 2004 by Montana Department of Agriculture (MDA), through a combined MDA and FWP program, to monitor weed management activities on FAS and some State Parks. The purpose of the project is to evaluate effectiveness of noxious weed control activities in high public-use sites and document level of weed infestations. The Montana Weed Management Plan identified the need for FWP to implement additional monitoring of weed management practices on FWP lands.

Public Awareness and Education

Early detection and treatment of weeds, and an overall effective preventive weed management program is dependent on education. Montana Fish, Wildlife, and Parks support public awareness and education on noxious weeds through both the Statewide Noxious Weed Awareness and Education Campaign Task Force and internal FWP programs. Objectives of the FWP Public Communication Plan for Noxious Weeds are to:

1. Inform and communicate noxious weed impacts and weed management partnership information to FWP permanent and seasonal employees.

2. Publicize FWP role on managing noxious weeds on lands they own and/or manage to the general public

3. Engage the public to assist FWP in managing noxious weeds on FWP owned and/or managed lands.

4. Educate the general public about noxious weed impacts to wildlife and habitat values.

The FWP Communication and Education Division has written 22 noxious weed news releases since 2000. They also developed radio public service announcements (PSA's), and supported special sportsman projects. FWP Field Services Division contributes up to about $3750.00 annually toward educational bulletins.

Public education programs and projects are also supported on a local level by FWP Regions across the state as part of partnership efforts. Regions around the state take an active role in participating in county and regional weed management activities including vehicle wash days to remove weed seeds from hunter vehicles, distributing weed brochures at public offices, weed pulls, cooperative "spray" projects, weed tours, and other educational programs. Hunter's Safety Program classes in some Regions educate participants on noxious weed identification and management. In addition, Region 2 provides about $500 annually toward public awareness and education.

Expenditures for Weed Management Activities

Expenditures for weed management activities are spent on lands owned and/or managed by FWP. In addition, FWP funds are spent on private and federal properties included in various habitat protection (i.e. Fisheries), hunter access (Block Management) and recreation access (Snowmobile and OHV Trails) programs managed by the Department. Due to the complexity of funding sources, most weed management activities on lands other than WMA are not funded as separate projects within the FWP budget. This is especially true for the Parks Division, which incorporates weed control funding in most site and program budgets. Current expenditures for noxious weed management within the Parks Division are anticipated to continue with the possibility for increases arising from inflation, new park/FAS acquisition, and establishment of new weed infestations. Weed control expenditures for FWP core programs are tracked through the state's SABHRS accounting system. Weed Control expenditures for habitat enhancement, hunter access and recreation access programs (private, state, and federal lands) are generally not tracked in terms of number of acres treated. Expenditures for noxious weed control and number of acres treated on FWP owned lands are shown in Table 3.3. Expenditures for noxious weed management on FWP owned or managed lands was $354,937 in 2007.

Table 3-3. Noxious weed acres treated on FWP lands and weed management expenditures from FY 2005 through 2007 (does not include administrative costs). [1]

Region	Ac. Treat 2007	FY 2007 Expenditure	Ac. Treat 2006	FY 2006 Expenditure	Ac. Treat 2005	2005 Expenditure
1	2188	56948	2329	$ 72321	2746	$ 55894
2	925	92026	1340	96113	1798	98851
3	2672	114495	1370	88032	971	67225
4	953	34804	1146	32022	935	27678
5	679	28896	1334	27370	566	20690
6	159	7560	1235	9497	504	6873
7	143	20208	271	20045	907	19116
Total	**7719**	**$354937**	**9027**	**$ 345400**	**8427**	**$ 296327**

[1]Indicates acres treated by all methods including herbicides, mechanical, and grazing. Acres effectively treated by biological agents are unknown. Total acres treated are less than actually shown since some infestations are treated more than one time or by more than one method.

Sources for funding FWP noxious weed management activities include:

- State Parks: earned revenue; % of Coal Tax; voluntary vehicle registration fee

- Fishing Access Sites: fishing license dollars; Governor's Access Montana (one-time allocation of funds)
- Wildlife Management Areas: license dollars
- Hatcheries and Administrative Sites: license dollars; warm water fish stamp

Other funding sources for weed management activities paid through programs managed by FWP are discussed below. The majority of these funds go toward weed management on non-FWP lands (private/federal) although FWP manages funding.

Parks Division

- Recreational Trails Program (RTP) is administered by FWP with federal oversight from the Federal Highway Administration. In FY07 there was $1.6 million in federal funding through FWP for the creation, completion, maintenance or renovation of recreational trails in Montana. The Recreational Trails Grant program requires a weed management plan for proposed project areas. Recreational Trails grant projects that specifically addressed noxious weed management totaled $9350 in FY07. Acres of noxious weeds treated through this program are not tracked by FWP.

- Off-Highway Vehicle Grants Program (OHV) funding is from 1/8 of 1% of the state Distributor's Gasoline License Tax, registration decal fees, dealer registration, and nonresident permit fees. Off-Highway Vehicle Grant funds totaling $300,000 were available through FWP for Fiscal Year 2007. Historically, most of the funded grant projects have included funding for weed education and control. OHV grant projects that specifically addressed noxious weed management totaled $14,100 in FY07. Acres of noxious weeds treated through this program are not tracked by FWP.

- Weed Intern Position was formed in response to the lack of FWP personnel available to work exclusively on weed infestation survey and monitoring, and provided for early detection of new invader species as well as some treatment monitoring. Weed inventory, early detection and monitoring were identified as FWP program needs in the Montana Weed Management Plan. The position was funded as a partnership between Montana Department of Agriculture and FWP. Total expenditure for the 80-day position including travel expenses was $8874.00 in FY07 with FWP allocating $3735.00.

- Fishing Access Sites: The Fishing Access Program receives a majority of it's funding from the sale of fishing licenses. One dollar from the sale of each resident fishing license and $5.00 from each non-resident fishing license is earmarked for the FAS Program. At least 75% of the money earned in this account must be used for operation and maintenance, including weed management activities. The remaining 25% is used for the purchase of new FAS's. Additional operations funding is also generated from the voluntary state park vehicle registration fees. The FAS Program receives $0.25 from registration fees of each vehicle participating in the program that is earmarked for FAS maintenance including weed management.

- Weed control activities are typically initiated on all newly acquired properties at the time of purchase. Funding is available from the statewide FAS program operations account for weed-infested properties. This account remains available to the Regional offices until existing noxious weed infestations have been reduced to a maintenance level. The Regional Parks Division then becomes responsible for day-to-day weed control activities.

Field Services Division

- Block Management Cooperator Weed Payments (from Sportsman dollars – SB325) This program is managed through Landowner/Sportsmen Relations Coordinator position and the Hunting Access Enhancement Program budget. In 2007, there were more than 1200 landowners that received weed payments totaling $184,613 for over 8 million acres enrolled in the program.

- Land Acquisitions: Funding for noxious weed management on newly acquired lands is initially from statewide Operations and Maintenance funds, unless funding accompanies the purchase. In the appropriate budget cycle a new weed management project on a WMA may be established or additional funding is added to the regional project for WMA

- Statewide Weed Coordinator Expenditures (educational materials): Approximately 10% of salary and operations of the Landowner/Wildlife Resource Specialist ($6723.00 annually) is budgeted toward weed coordination activities. Other expenses included $6350 to support outreach and education programs on invasive plants in FY07.

Wildlife Division

- Sikes Act (Public Law 92-452) federal legislation that has provided a total of $81,391 toward weed management projects on national forest lands and one FWP Wildlife Management Area as of FY07. Total FWP allocation specifically to weed management projects in 2007 was $10,000 with a federal match of $13,000.

Chapter 4. Plan of Action – Integrated Management Strategies

This comprehensive plan includes six major components. These components are: 1) public awareness and education; 2) prevention and early detection; 3) rapid response to control new introductions, and implementation of integrated management methods for species that are widely established; 4) restoration and rehabilitation; 5) research and new technology; and 6) inventory weed populations, and monitor and evaluate program results to measure progress towards expected results. The noxious weed management strategy is compatible with The Montana Weed Management Plan (2008) and FWP objectives.

Montana Fish, Wildlife and Parks in cooperation with county, state, tribes, and federal entities will use an integrated approach for managing weeds on FWP owned or managed lands in Montana. Management actions are based upon principles and practices consistent with current science. Action items for each component of the Integrated Noxious Weed Management Program will be addressed in this chapter of the plan. Action items will be reviewed, updated, and status of items reported annually.

LEADERSHIP

Leadership within Montana Fish, Wildlife, and Parks is essential for directing noxious weed programs, allocating limited resources, and observing state weed laws. A weed coordinator position will be supported within FWP to coordinate statewide weed management programs. The Department will support an integrated weed management program to protect and enhance desirable vegetation. In addition, FWP will foster proper land stewardship and support cooperative weed management areas to assist in protecting adjoining properties. Expected result of the leadership component of this plan is **to provide statewide guidance and leadership to enhance, coordinate, and implement IWM projects on FWP owned or managed lands in Montana.**

ACTION ITEMS: LEADERSHIP	RESPONSIBLE ENTITY
1. Fund the weed coordinator position at a minimum of a 0.5 FTE position.	FWP Director; Division Administrators; NWMAC
2. Annually review action items listed in this Plan and revise/ update as needed. Results of annual review (status of action items) will be provided to FWP Director, Division Administrators and Regional Supervisors.	NWMAC; FWP Weed Coordinator
3. Facilitate coordination between FWP Regions and County Weed Coordinators regarding noxious weed management on FWP lands.	FWP Weed Coordinator; CWD
4. Revise and consolidate weed activity reporting forms/timing schedules to maximize efficiency and usefulness of field staff reporting requirements.	FWP Weed Coordinator; MDA; NWMAC

5. Develop enforcement authority for weed seed free forage and other applicable weed laws for FWP enforcement on Department lands.	Enforcement Div; FWP Weed Coordinator; MDA; FWP Commission
6. Maintain Weed Advisory Committee and consider term limits for committee members	FWP Director; Division Administrators; NWMAC; FWP Weed Coordinator
7. Meet with County Weed Districts at least annually to discuss and formalize funding and cooperative agreements (MOU's) based on management priorities and available funding (Appendix D).	FWP Regional Managers ; CWD
8. Review cooperative agreements (MOU's) annually and update as necessary.	FWP Weed Coordinator; CWD; Regional Managers
9. Identify funding sources that can be utilized to enhance weed management efforts on FWP owned/managed lands, and identify sources of adequate long-term funding for weed management on new properties acquired by FWP. Initiate accountability for weed projects and/or programs.	FWP Weed Coordinator; Division Administrators; NWMAC
10. Develop weed management duties and responsibilities to include in job profiles for employees assigned weed management responsibilities.	FWP Weed Coordinator; NWMAC; Reg. Supervisors
11. Develop a strategy to phase in accountability procedures for weed management payments within Block Management Programs	FWP Weed Coordinator; Hunting Access Enhancement Coordinator
12. Increase involvement of FWP Communication Education Division in public awareness and training on noxious weeds	FWP Weed Coordinator; Comm./Educ. Division
13. Periodically review Regional Weed Management EA for on-ground program compliance.	FWP Weed Coordinator

PREVENTION AND EARLY DETECTION

Humans, their recreational activities, and vehicles have been identified as major distributors of invasive plant seeds. Areas owned and managed by FWP including FAS, Parks, and access points in WMA are high risk sites for invasive of noxious weeds due to high public use and disturbance. Prevention and early detection of newly invading species, and implementing rapid control measures are critical to protecting non-infested sites, and supporting county, state, and national weed management objectives. Prevention is the most practical and cost-effective weed management method, and is critical to the success of this plan. Expected result of the prevention component of this plan is **to protect non-infested sites and reduce establishment and spread of newly invading weeds on FWP owned or managed lands.**

ACTION ITEMS: PREVENTION /EARLY DETECTION	RESPONSIBLE ENTITY
1. Develop criteria regarding re-seeding, mulch, soil disturbance, equipment use and other soil disturbing activities within the Design and Construction Bureau to prevent weed introduction and spread.	FWP Weed Coordinator; D&C Bureau chief
2. Enhance enforcement of weed seed free forage laws on public lands through FWP Enforcement Division.	FWP Enforcement Division; MDA; FWP legal div; FWP Weed Coordinator
3. FWP will use only certified weed seed free forage on all FWP owned and managed lands.	FWP Regional Managers
4. Annually monitor high risk sites for weed introduction including post-construction sites, and trailheads, camping areas, roadsides, parking areas, and other high public-use areas.	FWP Regional Managers
5. Inventory and control weeds on FWP lands scheduled for major construction or reconstruction projects a minimum of one year prior to and two years following projects.	FWP Regional Managers
6. Clean maintenance equipment (mowers, etc) when moving from weed-infested to non-infested sites.	FWP Regional Managers
7. Institute an early detection/rapid response control program to stop establishment and spread of newly invading species, and eradicate infestations when possible.	FWP and CWD; contractor
8. Inform Montana Department of Agriculture (MDA) 406-444-3140, FWP State Weed Coordinator, and County Weed District on location of newly invading weeds (Category 2, 3, and 4) and permanently identify sites.	FWP Weed Coordinator; MDA; CWD; Regional Managers

9. Control newly invading noxious weeds and monitor sites at least twice annually (or more often as recommended for species) until seed is no longer viable in soil.	MDA, CWD, Regional Managers
10. Stop noxious weed seed production in high public use areas to reduce spread to non-infested sites.	FWP, CWD, MDA, FWP Regional Managers
11. FWP will subscribe to the regional weed alert system through UM Invaders Database and MWCA list serve. Weed coordinator will forward alerts to Regions.	FWP Weed Coordinator
12. Develop a program to encourage public assistance in locating and reporting noxious weed infestations on FWP owned lands. Information could be downloaded on FWP website.	FWP Weed Coordinator; NWMAC

MANAGEMENT

Management priorities for noxious weeds on FWP owned lands in Montana will vary based on extent of weed infestations, weed species present, FWP and/or county objectives, and ecological and environmental conditions. Both county and state-listed noxious weeds will be recognized by FWP; however, in most cases, state-listed noxious weeds will have priority over county-designated species. Native plants that may be listed on a county weed list will not be controlled by FWP. Management priorities and Special Management Zones will be discussed within this section. Special Management Zones are established to recognize needs and objectives for: 1) Visitor Service Zone (sites with high visitor use), 2) Undeveloped or Natural Areas, and 3) Riparian Zone. The expected result of the management component of this plan is to **implement effective IWM strategies to minimize seed production and expansion of noxious weed infestations**.

Management Priorities: General priorities based on site conditions and budgets.

Priority 1 (highest priority): Early detection and rapid control of new invaders and newly established infestations.

Priority 2: Complete control or eradication of established priority noxious weeds occurring as scattered, satellite infestations.

Priority 3: Control of noxious weed seed production in high public use areas to prevent spread.

Priority 4: Containment/control of relatively large-scale weed infestations in areas with critical habitat or sites adjacent to cooperative weed management areas.

New Invaders

Early detection and rapid control of newly invading noxious weeds is the highest priority on FWP managed lands in Montana. Species include Category 2 and 3 weeds on the Statewide Noxious Weed List. These species are targeted for early detection and long-term, high-intensity containment and control of current infestations, and prevention of movement to non-infested sites. Weeds of primary

concern are those not currently established in the state (yellow starthistle and common crupina) and those that occupy less than 1000 acres in the state (rush skeletonweed, yellow flag iris, dyers woad, purple loosestrife, flowering rush, knotweeds, and Eurasian watermilfoil). Counties or FWP may also include Category 1 as "new invaders" if species are not currently present or occur in small infestations on FWP owned lands or within the county.

ACTION ITEMS: MANAGEMENT NEW INVADERS	RESPONSIBLE ENTITY
1. Inventory existing infestations and sites surrounding new invaders as funding and resources allow.	Regional Managers
2. Ensure control of established new invaders by appropriate methods to achieve complete containment/removal of the species.	Regional Managers
3. Monitor treated sites at least annually to ensure complete control.	Regional Managers

Widespread Noxious Weeds

The Montana Weed Management Plan lists widespread infestations (Category 1 weeds) as a third priority for management. However, management of these weeds will vary based on FWP and county objectives, extent of weed infestations on FWP and adjoining lands, presence of Cooperative Weed Management Areas (CWMA), and Management Zone. Large infestations of noxious weeds will be managed through an integrated approach on FWP owned lands. Mowing or cutting, cultivation, hand pulling, biological agents, herbicides, vigilant monitoring, and restoration methods will be used at some level within all Management Zones. Descriptions of management activities within each zone are given below.

Special Management Zones

Visitor Service Zone:

The Visitor Service Zone includes developed sites, roads, parking areas, and campgrounds. These areas encompass both primitive and improved facilities, administrative and public buildings, and hatcheries. This zone is highly susceptible to introduction of noxious weeds and other non-native vegetation due to public use. Vegetation management objectives are to protect visitor and employee health and safety, promote enjoyment of the setting, preserve desirable vegetation, and stop movement of weeds from high public use areas to surrounding lands.

Management Methods for Visitor Service Zone

Mowing/cutting, hand pulling, vigilant monitoring, herbicides, and restoration methods will be used to reduce weed infestations and prevent seed production in the Visitor Service Zone. Mulching may be used in some areas to suppress vegetation especially around buildings and other high-impact zones. In general, biological control agents will not be released in high public use areas due to human disturbance, intensive management, and management objectives.

Mechanical and Manual Control: In areas outside of managed turf, conventional mowing should be conducted after cool season grasses have produced seed and when the majority of noxious weeds

are at late bud growth stage (late June to late July). This timing will allow for the greatest reduction in noxious weed seed production. Mowing height of non-turf grass species during the growing season should not be less than six (6) inches to reduce impact to desirable species. Mowing less than six includes reduces root and shoot biomass of desirable grasses resulting in decreased vigor. Follow mowing guidelines in Appendix H. Hand pulling and digging will be used on some sites to eliminate small infestations and stop weed seed production (Appendix M).

Herbicides: Herbicides used within this zone will be applied in a manner to minimize public exposure. The use of wick applicators or backpack sprayers (Appendix K), and spot treatments rather than broadcast spraying will help protect non-target vegetation and reduce area treated by herbicides. Treated areas will be posted in high-density public use areas. A sample posting notice is shown in Appendix J and record keeping forms in Appendix L. Herbicides effective on noxious weeds are shown in Appendix M.

Livestock Grazing: Domestic livestock may be used for targeted grazing of noxious weeds within this zone especially in more primitive campgrounds and picnic areas. Herders will be necessary to closely manage livestock and minimize human/livestock interactions. Public education will be an important component of any project in the Visitor Service Zone where domestic livestock are used as a weed management tool. With some exceptions as described under "Livestock Grazing" in Chapter 3, grazing of domestic livestock will be conducted within FWP minimum standards (Appendix G). Domestic sheep and goats will not be used within 10 miles of occupied bighorn sheep habitat due to concerns of disease transmission from domestic to wild sheep.

Restoration/ Reclamation: Non-vegetated areas or sites where vegetation is undesirable should be revegetated to desirable species to reduce potential for noxious weed invasion. If reseeding is necessary, species selected should meet the following criteria: resist weed invasion, non-invasive, have a low growth form that does not require mowing, establish easily without supplemental irrigation, and be adapted to disturbance. Native species and desirable, non-native species can be utilized depending on site use and management objectives. Revegetation is required (MCA 7-21-2152, Appendix C) for newly constructed roads, pipelines, and other major ground-disturbing activities. Appendix N lists resources and general seeding guidelines

ACTION ITEMS: MANAGEMENT ESTABLISHED NOXIOUS WEEDS IN VISITOR SERVICE ZONE	RESPONSIBLE ENTITY
1. Implement IWM strategies that stop noxious weed seed production.	FWP Regional Managers
2. Follow posting guidelines detailed in Appendix J in high public use areas such as developed campground, parking areas, and trailheads.	FWP Regional Managers
3. Monitor Visitor Use Zone a minimum of 2 times per year and implement control measures to stop noxious weed seed production.	FWP Regional Managers
4. Roadsides, parking areas, and trails will be monitored a minimum of once per year and noxious weeds controlled to stop weed seed production	FWP Regional Managers

Undeveloped or Natural Area Zone

This zone includes most land with Wildlife Management Areas, and land outside the Visitor Service Zone encompassed within Parks and FAS. The area includes some primitive trails and campsites that visitors can use for hiking and camping. Resource management priorities will focuses on protection and restoration of resources and natural processes. Access points and travel routes (trails) into undeveloped or natural areas, and newly established infestations in this zone are priorities for weed management.

Management Methods for the Undeveloped or Natural Areas

Management of weeds in this Zone will include protection of non-infested sites through early detection/rapid control of new infestations, containment of large infestations with integrated methods, and vigilant monitoring and control of weeds associated with roads, campsites, and parking areas.

Prevention and Containment: Prevention, early detection, and rapid control of satellite weed infestations are critical components of management within this Zone. Identification of non-infested sites and development of early detection and rapid response programs to protect non-infested areas is a high priority. Prevention strategies outlined in Appendix E will be followed as appropriate for the site-type.

Mechanical and Manual: Mowing on roadsides and parking areas will be limited to providing for public safety and access, and reducing weed seed production. Mowing as a weed management tool will be conducted after cool season grasses have produced seed and when the majority of noxious weeds are at the late bud growth stage (late June to late July). Follow mowing guidelines in Appendix H. Hand pulling may be used on small, isolated infestations to stop seed production and eliminate small populations of annual or tap-rooted weeds (Appendix M).

Herbicides: Herbicides will be used within this Zone as part of an integrated noxious weed management program. A variety of application techniques may be considered for use. Application method will depend on Regional EA, environmental conditions, management objectives, accessibility, and size of weed infestations. Herbicide application record forms are in Appendix L. Optimum herbicide use rates and application timing are in Appendix M.

Biological Control: Biological agents are an important component of weed management within this Zone. Large weed infestations and those located in areas where environmental conditions or access limit use of other control methods are especially suited to release of biological agents. Small weed infestations where the primary objective is to stop seed production and spread should be managed by hand-pulling, digging, and/or herbicides to eliminate the weed population. A complete review of available biological agents for noxious weeds can be referenced in "Biological control of invasive plants in the U.S" (Coombs, Clark, Piper, and Cofrancesco 2004). Additional information on availability of biological agents can be obtained from the County Weed District or as referenced in Appendix F.

Livestock Grazing: Domestic livestock may be used on FWP lands to enhance desirable vegetation through specialized grazing systems and targeting noxious weeds. Implementation of targeted grazing will consider compatibility of grazing with the habitat, management goals, weed infestation characteristics, livestock needs, and resources available to implement the program successfully. With some exceptions as described under "Livestock Grazing" in Chapter 3, livestock grazing will be conducted within FWP minimum standards (Appendix G). Domestic sheep and

goats will not be used within 10 miles of occupied bighorn sheep habitat due to concerns of disease transmission from domestic to wild sheep.

Restoration/ Reclamation: Restoring desirable vegetation must be an integral component of a weed management program when desirable vegetation as been lost or displaced. The use of both native species and desirable, non-native species may be considered depending on management objectives. Site adapted, desirable plants should be restored to sites that are lacking a desirable plant community as the result of invasive plant removal or disturbance. Appendix N lists considerations for seeding.

ACTION ITEMS: MANAGEMENT WIDESPREAD INFESTATIONS IN NATURAL/UNDEVELOPED AREAS	RESPONSIBLE ENTITY
1. Implement prevention guidelines described in Appendix E.	FWP Regional Managers
2. Identify areas that are weed free and establish an early detection (annual monitoring) and rapid control program to treat newly invading weeds within these "prevention areas".	FWP Regional Managers
3. Trails will be monitored a minimum of once/year and noxious weeds controlled to stop weed seed production as resources allow	FWP Regional Managers
4. Consider expanding implementation of targeted grazing as a noxious weed management tool.	FWP Regional Managers
5. Expand weed management partnerships with adjoining landowners and CWD.	CWD; Regional Managers
6. Identify sites where restoration/reclamation activities are required and implement appropriate restoration as needed.	Regional Managers

Riparian Zone

Riparian Zones are green, vegetated areas located along natural water bodies such as rivers, creeks, lakes, springs, sloughs, potholes, and wetlands. They are the transition zone between upland and aquatic ecosystems. Increased soil moisture or shallow groundwater in these areas produces unique plant communities that differ from surrounding land. Riparian areas account for a small percentage of total land base in Montana, but provide important environmental and economic benefits. Riparian areas are present in both the Visitor Service Zone and Undeveloped/Natural Area Zone.

Invasive plants such as Russian olive, and noxious weeds including purple loosestrife, yellowflag iris, houndstongue, leafy spurge, common tansy, Canada thistle, knapweeds, and tamarisk are well adapted to riparian habitats. These species are capable of altering stream flows, impacting recreational use of the site, and/or degrading wildlife habitat. Some tap-rooted invasive plants, such as the knapweeds, can lead to increased soil erosion and sediment yield ultimately impacting water quality.

Montana Fish, Wildlife and Parks are committed to protecting and enhancing riparian areas in the state. Successful riparian weed management requires an integrated, well-planned strategy.

Management Methods for Riparian Zone

Prevention and Containment

Preventing introduction of weeds into riparian areas is critical to management of these sites. Nearly all weed seeds float and spread rapidly along waterways. Follow invasive plant prevention guidelines for watersheds in Appendix E.

Minimize soil disturbance: Variation in stream flow is a common cause of soil disturbance in riparian areas. When possible, reduce extremes in stream flow by maintaining uplands in good ecological condition. Minimize soil disturbance by vehicles, machinery, wildlife, water flow and livestock in riparian zones and rehabilitate disturbed sites as soon as possible.

Properly manage desirable vegetation: Proper management of desirable riparian vegetation is essential to prevent weed encroachment. Encouraging native tree and shrub species will provide shade and reduce competitive ability of noxious weeds. Riparian plants such as sedges are capable of limiting weed invasion, and bind soil reducing erosion.

Restoration/ Reclamation

Damaged or weedy riparian areas can usually recover with proper management since the habitat is fertile and moisture is plentiful. However, vegetation must be present for recovery. In areas without adequate native or other desirable vegetation, revegetation is necessary to reintroduce desired plants.

Establishing riparian plants from seed is difficult because site hydrology must be considered. Planting greenhouse-grown "plugs" of desirable vegetation is the most effective method to establish vegetation. Greenhouse-grown plugs of grasses, grass-like species, forbs, and shrubs have higher establishment rates and spread faster than seeds or wildlings (plugs collected from wild populations). Spring planting is generally preferred over fall planting since plants will have a longer establishment period.

Livestock Grazing

Proper management of riparian vegetation is essential to preclude weed encroachment. Targeted grazing of invasive plants in riparian areas with livestock must be carefully managed to impact the weed, and minimize damage to native riparian species and stream banks. Sheep and goats have successfully controlled leafy spurge along rivers and streams. Montana State University Sheep Institute or MSU County Extension Agents, in conjunction with FWP range specialist can help design a grazing strategy for these sites. With some exceptions as described under "Livestock Grazing" in Chapter 3, livestock grazing will be conducted within FWP minimum standards (Appendix G). Domestic sheep and goats will not be used within 10 miles of occupied bighorn sheep habitat due to concerns of disease transmission from domestic to wild sheep.

Herbicides

Herbicides must be used with care to protect non-target vegetation and prevent water contamination. There are herbicides labeled for use to the waters edge, and those than can be applied to water for treatment of emerged aquatic vegetation such as purple loosestrife. Be sure to consult and following the label before applying herbicides.

Hand application of herbicides with wick applicators or backpack sprayers (Appendix K), and spot treatments rather than broadcast spraying will help protect non-target vegetation. Herbicides should be applied when runoff due to rainfall or snowmelt is unlikely. Using herbicides with shorter life spans (short half-life), low water solubility, and applying above the mean high water mark will reduce possibility of water contamination. Prevent damage from herbicide drift by spraying in the absence of wind or with very low wind speeds (<8 mph) that would move the herbicide away from open water and

non-target vegetation. Following are some herbicides that can be applied in a riparian environment within the constraints of the label.

- **Metsulfuron:** Cimarron®. Effective on plants in the mustard family (hoary cress, perennial pepperweed), borage family (houndstongue), common tansy and other species described in the label. May be applied up to the waters edge, do not allow herbicide to get in water. Do not apply over-the top and around desirable trees or shrubs.
- **Aminopyralid:** Milestone®. Effective on plants in the sunflower family (thistle, knapweed, hawkweed), will not harm grasses at label rates. May be applied up to the waters edge, do not allow herbicide to get in water. Do not apply over-the-top of desirable trees and shrubs, or within the drip-zone of conifers. Plants in the legume and rose family are very susceptible to injury.
- **2,4-D amine**: Used for broadleaf weed control. Do not apply directly to water except under specific label directions. Some labels allow for over-spray on irrigation canal ditch banks. Refer to the labels for specific directions.
- **Glyphosate:** Glyphosate products labeled for aquatic use may be applied along ditches, lake and pond banks, streams and rivers. Follow label directs and note restrictions for application buffers on potable water intakes. It is a non-selective herbicide (kills both broadleaf and grass plants); use caution around non-target vegetation. Recommended for spot-application only.
- **Imazapyr:** Habitat®. Used for tamarisk (saltcedar) and Russian olive control. Consult label for applications directly to water. Apply 2 qts/ac to actively growing foliage. Can be applied to cut-stumps. Do not disturb treated plants for 2 yrs.
- **Triclopyr:** Garlon®. Control of woody plants (Japanese knotweed). Sensitive plants include desirable woody species such as aspen, cottonwood, dogwood, elderberry, hawthorn, willow, choke cherry, and pines. It is permissible to treat non-irrigation ditch banks, seasonally dry wetlands, flood plains, deltas, marshes, swamps, bogs, and transitional areas between upland and lowland sites. Do not apply to open water or to below the mean high water mark.

Read and follow herbicide labels regarding application restrictions based on soil, groundwater, and surface water features.

Biological Control

Natural enemies might appear well suited for controlling weeds along riparian areas because they do not impact water quality. However, most biological control agents stress the weeds or reduce seed production, but do not kill the plants. If your primary objective is to stop seed production and spread, you will have to integrate other management methods with biological agents.

Biological control agents are available for several weeds infesting riparian areas in Montana. Resources for biological control agents are shown in Appendix F.

ACTION ITEMS: MANAGEMENT OF WIDESPREAD WEEDS IN RIPARIAN SITES	RESPONSIBLE ENTITY
1. Support ANS Task Force to address prevention of weed introduction and management.	Directors of FWP, and MDA; MNWSAC
2. Contact CWD and/or watershed managers for existing weeds and new invader status on rivers and riparian areas, and to coordinate weed management partnerships.	FWP Regional Managers; CWD

3. Identify weed-free riparian areas and water bodies and prioritize protection of these sites.	FWP Regional Managers
4. Identify sites where woody riparian overstory is lacking or could be enhanced and restoration projects.	FWP Regional Managers
5. Educate waterway users about noxious weeds and invasive plants along riparian areas.	FWP Regional Managers; Communic./Educ. Div.
6. Work with counties to develop partnerships between FWP and other land management entities for managing riparian corridors.	FWP Regional Managers; CWD
7. Develop management criteria for Russian olive on FWP lands to address local/state concerns and federal legislation regarding Russian olive (PL109-320).	NWMAC; Weed Coordinator

RESTORATION/RECLAMATION

Revegetation planning is an integral component of a weed management program when loss or displacement of desirable species occurs. Areas lacking competitive desirable vegetation become re-infested with either the same or new weed species. Restoring disturbed sites is critical to slow establishment and spread of weed species. The expected result of this component is **to decrease susceptibility of disturbed lands to noxious weed invasion and establishment.**

ACTION ITEMS: RESTORATION/RECLAMATION/RESEEDING	RESPONSIBLE ENTITY
1. Restore desirable vegetation on disturbed areas as soon as possible following disturbance activity.	FWP Regional Managers, contractors
2. Evaluate restoration and reclamation projects annually for up to three years following seeding to determine if seed establishment was successful.	FWP Regional Managers; contractors
3. Work with Design & Construction engineers to develop BMP's that facilitate establishment of desirable vegetation following construction (including seed mixes, procedures, and pot-revegetation monitoring).	FWP Weed Coordinator, D&C
4. Identify historically disturbed sites where revegetation or restoration is needed to restore desirable plant communities and implement projects to restore sites.	FWP Regional Managers

RESEARCH AND NEW TECHNOLOGY

Montana Fish, Wildlife and Parks recognize the need for research and new technology for vegetation management that minimizes establishment of noxious weeds and reduces maintenance costs. The expected result of this component is to **support and partner with research projects involving noxious or invasive weed biology, ecology and management, and projects enhancing desirable vegetation on FWP lands.**

ACTION ITEMS: RESEARCH AND NEW TECHNOLOGY	RESPONSIBLE ENTITY
1. Work cooperatively with other agencies and universities on suitable species for restoration.	FWP Regional Managers, FWP Weed Coordinator
2. Support research on weed biology, ecology, and management.	FWP Regional Managers, FWP Weed Coordinator
3. Partner with agencies to develop insect rearing facilities for optimizing biological control releases on FWP lands.	FWP Regional Managers, FWP Weed Coordinator
4. Support research on impacts of invasive non-native plants on native plants and animals.	FWP Regional Managers, FWP Weed Coordinator
5. Develop partnerships with universities and other agencies or institutions to study BMP for invasive non-native plants.	FWP Regional Managers, FWP Weed Coordinator

PUBLIC AWARENESS AND EDUCATION

Early detection and treatment of weeds, and an overall effective preventive weed management program is dependent on education. Public education is a critical component of The Montana Weed Management Plan (2005) and is the focus of the Montana Statewide Noxious Weed Awareness and Education Campaign. Expected result of the public awareness and education component for FWP is to **increase public awareness of noxious weeds in Montana and improve training for FWP employees on identification and management of state and county designated noxious weeds.**

ACTION ITEMS: PUBLIC AWARENESS AND EDUCATION	RESPONSIBLE ENTITY
1. Support Statewide Noxious Weed Awareness and Education Campaign Task Force.	FWP Weed Coordinator; Comm./Ed Div
2. Add noxious weed management information on FWP Web to include Plan goals and objectives with links to other weed information (identification, programs, etc.).	Comm./Ed Div FWP

3. Enhance existing programs to improve training for FWP employees (including field staff – wardens, biologists, interns, seasonal employees, etc.) on weed identification and management.	FWP Weed Coordinator; CWD; MDA; Comm./ Ed Div; NWMAC; Regional Managers
4. Work with special interest groups and programs (Trout Unlimited; Ducks Unlimited, etc) to include weed identification and awareness for recreationists.	Communication/Ed Div.; Weed Coordinator; Regional Managers
5. Develop timely "feature weed" articles for inclusion in Montana Outdoors	Communication/Ed Div.; FWP Weed Coordinator
6. Encourage and support FWP staff attendance at the MWCA annual convention.	Regional Managers; FWP Weed Coordinator

INVENTORY, MONITORING AND EVALUATION

Inventory

Expected results of weed inventory are to **inventory and record locations of noxious weeds on FWP owned and managed lands** based on funding and resources. This information is critical for identifying location and infestation boundaries of newly invading species, developing long-term weed management goals and objectives, and monitoring status of weed management efforts. The level of accuracy of the inventory may depend on weed species, accessibility of the site, and size of infestations. Newly invading species (Category 2 and 3 weeds) will have a higher level of survey detail (i.e. GPS locations) compared to extensive weed infestations.

ACTION ITEMS: INVENTORY	RESPONSIBLE ENTITY
1. Work cooperatively with FWP employees, contractors, and county weed districts to inventory lands for weed infestations.	FWP Weed Coordinator; CWD; NWMAC
2. Expand responsibility of MDA/FWP weed monitoring interns to include weed inventory of FAS.	MDA and FWP Weed Coordinator
3. Promote statewide weed inventory on FWP lands using the Montana Inventory and Mapping System and input data into state database.	FWP Weed Coordinator, CWD, Regional Managers
4. Identify sources for additional funds for employee training, equipment, and personnel to conduct weed inventories.	FWP Weed Coordinator; NWMAC

5. Secure assistance of FWP Information and Technology staff to input existing weed data on field maps into a statewide weed-data storage and retrieval system.	FWP Weed Coordinator

Monitoring

The expected results of a monitoring system are to **measure effectiveness of various programs (management, public education, etc) over time and compile information to develop effective management decisions**. A sample monitoring form is included in Appendix O. The following components are considered a baseline for monitoring the status of weed management program.

ACTION ITEMS: MONITORING	RESPONSIBLE ENTITY
1. Monitor effectiveness of weed management methods on FWP owned/managed lands and measure compliance with FWP Noxious Weed Management Plan.	FWP Regional Managers; Weed coordinator; MDA
2. Compare changes in weed inventory data over time.	FWP Regional Managers
3. Conduct informal review of inventory practices.	FWP weed coordinator; MDA; NWMAC
4. Establish representative sites within each Region to collect quantitative vegetation data (i.e. cover, frequency, density) prior to and following implementation of weed management practices (as time and revenue permit)	FWP Regional Managers; MDA.

Evaluation

Evaluation is relating information obtained from monitoring to objectives of the Plan. Evaluations will help determine if the weed management program accomplishes plan objectives, and if the Plan is desirable and realistic. Evaluation requires analyzing information gained through monitoring, including benefits versus costs, comparing it with the cost/benefit of other alternatives, comparison with untreated areas, and projected costs of no action.

Information gained from monitoring weed infestations and other program components will be used to improve future weed management efforts on FWP lands. This evolving, or "adaptive" management allows FWP to learn from past experiences, improve effectiveness, and reduce impacts.

ACTION ITEMS: EVALUATION	RESPONSIBLE ENTITY
1. Review implementation of Plan action items annually or as needed.	FWP Weed Coordinator; MDA, NWMAC

2. Evaluate effectiveness of action items in meeting Plan expected results.	FWP Weed Coordinator; NWMAC
3. Review expected results and action items of the Plan to determine if they are realistic and desirable.	FWP Weed Coordinator; NWMAC

Chapter 5. Plan Implementation and Budgets

BUDGETS FOR A COMPREHENSIVE WEED MANAGEMENT PROGRAM

A balanced comprehensive weed management program that segments funding toward public education and awareness, training, prevention, early detection, management, and rehabilitation is vital to successfully manage weed infestations on FWP lands in Montana. Based on current infestations of an estimated 32,650 acres and treatment of 7000 acres per year, an annual budget of about $535,400 would be needed just to support on-ground integrated weed management on FWP lands. Because of continuous introduction of new weed species, difficulty in containing and reducing existing infestations, and expense of expanding control efforts to stop noxious weed spread from high public use areas, the present budget is inadequate to meet needs of a balanced program. Costs for management activities were based on the following assumptions and average costs statewide.[2]

Weed Status

A total of 32,650 acres are infested with noxious weeds (28,728 acres in WMA; 1315 acres in Parks; and 2607 acres in FAS)

- Average noxious weed spread rate per year = 10% (based on western U.S. spread of most species)

Management Cost/Acre

- Herbicide (used FY07 FWP accounting summary)
    - Ground application: $80/ac to $170/ac depending on application method[3] (vehicle-mounted sprayer or backpack/handline respectively [4])
    - Aerial application: $35/ac aerial[5]
- Targeted grazing with sheep: $9.60/ac[6]
- Mechanical Control: Mowing: $28.00 (note cost for weed mowing by hand $60/ac) to $250.00/ac[7] for seedbed preparation and seeding.
- **WMA: Total infested acres, 28728. Treat 4300 ac/yr or about 15% of infestations/yr:**
    - Targeted grazing: 700 acre @ $9.60/ac [$6720]
    - Herbicides: 2200 acre ground @ $80/acre [$176,000] and 1200 acre aerial herbicide application @ $35/ac [$42,000]
    - Biological control agents: acres "treated" is not quantified [$26,000]
    - Mechanical control: 100 ac hand/mechanical mowing @ $40/ac [$4000]; 100 acres revegetation/ restoration @ $250/ac [$25,000]
    - Total for management on WMA = **$279,700/yr**
- **FAS: Total infested acres, 2607. Treat 1800 ac/yr or about 70% of total infested** (high percentage of acres need to be treated due to public use)
    - Targeted grazing: 500 acre @$9.60/ac [$4800]
    - Herbicides: 1100 acre ground application: 550 acres @ $80 [$44,000]; 550 acres @ $170/ac [$93,500]
    - Biological control agents: acres treated not quantified [$2500]

[2] FWP 2007 reported cost figures for weed management activities do not include FWP labor expenditures. The report was not used to determine average costs statewide due to labor exclusion.

[3] NWTF estimate (Burch personal communication 2007)

[4] Based on 2006 figures averaged from Cascade County and Sweetgrass County for weed management activities on FAS and State Parks (Barta and Freeman, personal communication 2007)

[5] NWTF estimate (Burch personal communication 2007)

[6] Based on figures from Sweetgrass County for targeted grazing for leafy spurge management (Barta personal communication 2007)

[7] Justin Juelfs, MDT 2007 mowing price (rounded to whole number); Phil Johnson, MDT seedbed prep.

  - Mechanical control: 150 acre hand/mechanical mowing @ $40/ac [$6000]; 50 acres revegetation/ restoration @ $250/ac [$12,500]
  - Total for management on FAS = **$163,300/yr**
- **State Parks: Total infested acres, 1315. Treat 900 ac/yr or about 70% of total infested.**
  - Targeted grazing: 200 ac @ $9.60 [$1920]
  - Herbicide: 640 ac ground application: 400 ac @ $80/ac [$32,000]; 240 ac @ $170/ac [$40,800]
  - Biological control agents: acres "treated" is not quantified [$1200]
  - Mechanical control: 10 acres @ hand/mechanical mowing @ $40/ac [$4000]; 50 ac reseeding/restoration @250/ac [$12,500]
  - Total for management on Parks = **$92,420/yr**
- **Total cost of on-ground IWM on FWP owned/managed lands based on required treatment levels is $535,400.**

A comprehensive weed management program must include leadership, public education and awareness, and employee training, along with on-ground IWM efforts, thus total revenue needed is about $613,000 annually. Table 5-1 shows current and proposed budget allocation for a comprehensive weed management program on FWP owned or managed lands. Allocations were based on The Montana Weed Management Plan (2008).

Table 5-1. Current and proposed budget allocation for weed management activities on FWP owned or managed lands.

Management Activity	Current Expenditures (estimated)[8]	Current Budget Distribution %	Proposed Budget Allocation	Proposed Budget Distribution %	FWP employee expenditures – weed program support	In kind expenditures
1. Public Education/training	$ 6350	1	$ 17,500[9]	3	32,500[10]	$ 5000 CWD/CES/MWCA
2. Prevention/ Early Detection	7100	2	43,000	8		
3. Rapid Response	30,000	8	86,000	15		
4. Management	246,381	66	374,400	65		
5. Restoration	71,456	19	32,000	5	18,000 D&C	
6. Inventory/monitoring*	3645 (intern)	<1	20,000	4		8874 (MDA)
7. Leadership	6723 (coordinator)		40,000[11]			
TOTAL	**371,655**		**612,900**			

[8] Total current budget of $354937 was divided between restoration, management, EDRR. Other costs added for intern and weed coordinator position.
[9] $12,500 for training [$500/employee X 25 (travel + training fee)] + ~$5000 to statewide awareness/education
[10] Based on 25 employees at 5 days @ $260/day (salary + benefits)
[11] 0.5 FTE weed coordinator position including travel.

IMPLEMENTATION

The key to success of the FWP Integrated Noxious Weed Management Plan is dependent on the ability of responsible entities to implement action items identified in the Plan. Chapter 4 identifies key action items within the plan and responsible entity.

EVALUATION AND REVISION

Evaluation of progress on action items is critical to determine whether modifications or additions to the plan are necessary to improve facilitation and implementation. Action items within this Plan will be reviewed annually by April 1 to determine if items are implemented, and if objectives are being met.

The FWP Integrated Noxious Weed Management Plan will be reviewed biennially by Montana Department of Agriculture and the FWP Noxious Weed Management Advisory Committee. Status of action items will be reviewed, updated as needed, and suggestions identified for facilitation of the Plan. Substantial changes can be approved through FWP Directors Office and Regional Supervisors. FWP will be responsible for scheduling a review process and implementing revisions in the Plan. This Plan meets requirements of The Montana County Weed Control Act (7-22-2151) for a state agency weed management plan.

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Chapter 7. Appendices

APPENDIX A. THE STATEWIDE NOXIOUS WEED LIST AND ACRES INFESTED

Noxious weed acres are based on estimates and inventory data by county weed districts with input from Tribes, and public/private land managers. Acreage estimates for Canada thistle and field bindweed were difficult to obtain because of presence in cropland. Acreage infested for Category 2 and 3 weeds are based to a greater extent on field inventories, accounting for greater accuracy than for Category 1 weeds.

Category 1.	**Acres Infested**
Canada thistle (*Cirsium arvense*)	1,400,000
Field bindweed (*Convolvulus arvensis*)	764,000
Whitetop or hoary cress (*Cardaria draba*)	127,000
Leafy spurge (*Euphorbia esula*)	797,000
Russian Knapweed (*Centaurea repens*)	66,500
Spotted knapweed (*Centaurea maculosa*)	2,500,000
Diffuse knapweed (*Centaurea diffusa*)	8,500
Dalmatian toadflax (*Linaria dalmatica*)	174,000
St. Johnswort (*Hypericum perforatum*)	98,000
Sulfur (Erect) cinquefoil (*Potentilla recta*)	328,000
Common tansy (*Tanacetum vulgare*)	52,500
Ox-eye daisy (*Chrysanthemum leucanthemum* L.)	105,000
Houndstongue (*Cynoglossum officinale* L.)	381,500
Yellow toadflax (*Linaria vulgaris*)	29,500
Hoary alyssum (*Berteroa incana*)	54,500
Total acres	**6,866,000**

Category 2.	
Rush skeletonweed (*Chondrilla juncea*)	703
Purple loosestrife or Lythrum (*Lythrum salicaria, L. virgatum,* and any hybrid crosses thereof).	400
Tansy ragwort (*Senecio jacobea* L.)	201,228
Meadow Hawkweed Complex (*Hieracium pratense, H. floribundum, H. piloselloides*)	15,525
Orange hawkweed (*Hieracium aurantiacum* L.)	56,124
Tall buttercup (*Ranunculus acris* L.)	20,551
Tamarisk [Saltcedar] (*Tamarix* spp.)	160,907
Perennial pepperweed (*Lepidium latifolium*)	4,863
Blueweed (Echium vulgare)	35,466
Yellow flag iris (*Iris pseudacoru*)	17,303
Total acres	**513,070**

Category 3.	
Yellow starthistle (*Centaurea solstitialis*)	0
Common crupina (*Crupina vulgaris*)	0
Eurasian watermilfoil (*Myriophyllum spicatum*)	200+
Dyers woad (*Isatis tinctoria*)	154
Knotweed complex (includes Japanese knotweed, *Polygonum cuspidatum*; giant knotweed *P. sachaliness;* and Bohemian knotweed, *P. bohemica*)	201
Flowering rush (*Butomus umbellatus*)	801
Total acres	**1,381**
Category 4.	
Scotch broom (*Cytisus scoparius*)	25

APPENDIX B. COUNTY DESIGNATED NOXIOUS WEEDS

Species\County	BEAVERHEAD	BIG HORN	BLAINE	CARBON	CHOUTEAU	DEER LODGE	FALLON	FLATHEAD	GALLATIN	GLACIER	JUDITH BASIN	LAKE	LEWIS & CLARK	LIBERTY	LINCOLN	MADISON	MINERAL	MUSSELSHELL	PETROLEUM	PONDERA	POWELL	RAVALLI	ROSEBUD	SANDERS	SHERIDAN	SILVER BOW	STILLWATER	SWEET GRASS	TETON	VALLEY	YELLOWSTONE	**Total Counties**
Achillea millefolium (yarrow)								X																								**1**
Anchusa officinalis (bugloss)															X																	**1**
Anthemis cotula (dog fennel)																	X															**1**
Arctium lappa, A. minus (burdock)		X					X				X				X	X			X	X							X	X				**8**
Artemisia absinthium (absinth wormwood)				X				X							X																	**3**
Asclepias speciosa (showy milkweed)**					X									X						X					X				X		X	**6**
Azolla mexicana (pennata) (mosquito fern)												X																				**1**
Berteroa incana (hoary alyssum)																X																**1**
Butomus umbellatus (flowering rush)												X																				**1**
Campanula rapunculoides (bellflower)								X																								**1**
Carduus acanthoides (plumeless thistle)															X																	**1**
Carduus nutans (musk thistle)	X			X	X			X	X	X		X			X	X			X	X			X					X	X			**14**
Carum carvi (caraway)																					X					X						**2**
Centaurea pratensis (meadow knapweed)								X	X						X																	**3**
Chaenorrhinum minus (dwarf snapdragon)															X																	**1**
Chorispora tenella (blue mustard)												X																			X	**2**
Cichorium intybus (chicory)															X																	**1**
Cicuta douglasii (water hemlock)**																															X	**1**
Cirsium vulgare (bull thistle)																												X				**1**
Conium maculatum (poison hemlock)		X					X	X	X						X				X				X								X	**8**
Dipsacus fullonum (teasel)	X																														X	**2**
Elaeagnus angustifolia (Russian olive)																																**1**
Euphorpia (some natives species)**								X																								**1**
Glycyrrhiza lepidota (wild licorice)**					X																											**1**
Gypsophila paniculata (baby's breath)			X			X		X																	X	X						**5**
Hydrilla verticillata (water thyme)												X																				**1**
Hyoscyamus niger (black henbane)	X	X								X	X					X																**4**
Hypochaeris radicata (spotted cat's-ear)															X																	**1**
Knautia arvensis (field scabious)	X															X																**2**
Kochia scoparia (kochia)						X									X																	**2**
Lycium halimifolium (matrimony vine)																										X						**1**

** Caution - native species

Species\County	BEAVERHEAD	BIG HORN	BLAINE	CARBON	CHOUTEAU	DEER LODGE	FALLON	FLATHEAD	GALLATIN	GLACIER	JUDITH BASIN	LAKE	LEWIS & CLARK	LIBERTY	LINCOLN	MADISON	MINERAL	MUSSELSHELL	PETROLEUM	PONDERA	POWELL	RAVALLI	ROSEBUD	SANDERS	SHERIDAN	SILVER BOW	STILLWATER	SWEET GRASS	TETON	VALLEY	YELLOWSTONE	**Total Counties**
Matricaria maritima (pineapple weed, scentless chamomile)					X			X		X					X		X															**5**
Onopordum acanthium (scotch thistle)				X	X										X			X					X									**5**
Reseda lutea (yellow mignonette)											X																					**1**
Rumex acetosella (sheep sorrel)												X																				**1**
Rumex crispus (curly dock)						X																										**1**
Salvia nemorosa (woodland sage)																												X				**1**
Silybum marianum (milk thistle)				X																												**1**
Solidago canadensis (Canada goldenrod)**													X																			**1**
Sonchus arvensis (perennial sowthistle)					X		X							X					X	X												**5**
Tragopogon dubius (meadow salsify)												X																				**1**
Tribulus terrestris (puncturevine)																															X	**1**
Verbascum thapsus (mullein)	X					X					X					X	X										X				X	**7**
Veronica chamaedrys (Germander speedwell)															X																	**1**
Veronica officinalis (common speedwell)															X																	**1**
Xanthium strumarium (common cocklebur)																												X				**1**
Total species	**6**	**3**	**1**	**5**	**6**	**5**	**4**	**10**	**4**	**4**	**4**	**10**	**2**	**2**	**18**	**7**	**5**	**1**	**4**	**4**	**2**	**2**	**3**	**1**	**2**	**3**	**2**	**6**	**2**	**0**	**7**	

** Caution - native species

APPENDIX C. MONTANA COUNTY WEED CONTROL ACT (7-22-2151 MCA)

7-22-2151. Cooperative agreements. (1) A state agency that controls land within a district, including the department of transportation; the department of fish, wildlife, and parks; the department of corrections; the department of natural resources and conservation; and the university system, shall enter into a written agreement with the board. The agreement must specify mutual responsibilities for integrated noxious weed management on state-owned or state-controlled land within the district. The agreement must include the following:

(a) an integrated noxious weed management plan, which must be updated biennially;

(b) a noxious weed management goals statement;

(c) a specific plan of operations for the biennium, including a budget to implement the plan; and

(d) a provision requiring a biennial performance report by the board to the state weed coordinator in the department of agriculture, on a form to be provided by the state weed coordinator, regarding the success of the plan.

(2) The board and the governing body of each incorporated municipality within the district shall enter into a written agreement and shall cooperatively plan for the management of noxious weeds within the boundaries of the municipality by January 1, 2002. The board may implement management procedures described in the plan within the boundaries of the municipality for noxious weeds only. Control of nuisance weeds within the municipality remains the responsibility of the governing body of the municipality, as specified in 7-22-4101.

(3) A board may develop and carry out its noxious weed management program in cooperation with boards of other districts, with state and federal governments and their agencies, or with any person within the district. The board may enter into cooperative agreements with any of these parties.

(4) Each agency or entity listed in subsection (1) shall submit a statement or summary of all noxious weed actions that are subject to the agreement required under subsection (1) to the state weed coordinator and shall post a copy of the statement or summary on a state electronic access system.

History: En. Sec. 10, Ch. 607, L. 1985; amd. Sec. 1, Ch. 262, L. 1991; amd. Sec. 3, Ch. 512, L. 1991; amd. Sec. 31, Ch. 418, L. 1995; amd. Sec. 1, Ch. 519, L. 1995; amd. Sec. 30, Ch. 546, L. 1995; amd. Sec. 16, Ch. 407, L. 2001.

7-22-2152. Revegetation of rights-of-way and areas that have potential for noxious weed infestation. (1) Any person or state agency proposing a mine, a major facility under Title 75, chapter 20, an electric, communication, gas, or liquid transmission line, a solid waste facility, a highway or road, a subdivision, a commercial, industrial, or government development, or any other development that needs state or local approval and that results in the potential for noxious weed infestation within a district shall notify the board at least 15 days prior to the activity.

(2) Whenever any person or agency constructs a road, an irrigation or drainage ditch, a pipeline, an electric, communication, gas, or liquid transmission line, or any other development on an easement or right-of-way, the board shall require that the areas be seeded, planted, or otherwise managed to reestablish a cover of beneficial plants.

(3) (a) The person or agency committing the action shall submit to the board a written plan specifying the methods to be used to accomplish revegetation at least 15 days prior to the activity. The plan must describe the time and method of seeding, fertilization practices, recommended plant species, use of weed-free seed, and the weed management procedures to be used.

(b) The plan is subject to approval by the board, which may require revisions to bring the revegetation plan into compliance with the district weed management plan. The activity for which notice is given may not occur until the plan is approved by the board and signed by the presiding officer of the board and by the person or a representative of the agency responsible for the action. The signed plan constitutes a binding agreement between the board and the person or agency. The plan must be approved, with revisions if necessary, within 10 days of receipt by the board.

History: En. Sec. 11, Ch. 607, L. 1985; and. Sec. 17, Ch. 407, L. 2001.

7-22-2154. Public purchase or receipt of property -- weed management plan. (1) Except as provided in subsection (4), prior to the purchase of real property with public funds or the receipt of real property by a nonfederal public entity, the purchaser or grantee shall have the property inspected by the county weed management district. The county weed management district's report regarding the property must be filed with the purchaser or grantee. The costs associated with the inspection must be borne by the seller or grantor.

(2) If the report indicates that there are noxious weeds present on the property, the purchaser, seller, grantee, or grantor shall develop a noxious weed management agreement to ensure compliance with the district noxious weed management program. However, unless the parties agree otherwise, a seller or grantor is obligated by a noxious

weed agreement only until the property sale or transfer is completed. Except as provided in subsection (4), the weed management agreement must be incorporated into the purchase agreement.

(3) The provisions of this section do not apply to:

(a) the state acquisition or disposition of a public right-of-way pursuant to Title 60, chapter 4; or

(b) lands sold or purchased through land banking pursuant to 77-2-361 through 77-2-367.

(4) If a transfer of property will occur during the winter months when the ability to identify noxious weeds is significantly reduced by snow cover, the purchaser, seller, grantee, or grantor may request a 6-month extension for completion of the inspection and any noxious weed management agreement that may be required. If, upon inspection, it is determined that a noxious weed management agreement is necessary, unless otherwise agreed by the parties, the purchaser or grantee is responsible for implementing the provisions of that agreement.

History: En. Sec. 1, Ch. 395, L. 2005.

APPENDIX D. NOXIOUS WEED MANAGEMENT AGREEMENT AND OPERATION PLAN

NOXIOUS WEED MANAGEMENT AGREEMENT AND OPERATION PLAN FOR _____ COUNTY

Montana Fish, Wildlife & Parks has adopted a Statewide Noxious Weed Management Plan which describes a broad management approach to controlling noxious weeds on FWP owned and managed properties. The plan covers Wildlife Management Areas (WMA), Fishing Access Sites (FAS), State Parks (SP), and any other properties that are owned or managed by FWP. The plan is available at any FWP Regional office or at FWP Headquarters in Helena.

Overall goals of the plan are to: comply with state and county weed control laws; reduce influence of weeds on native plants and animals; accomplish effective weed management while minimizing the potential for adverse environmental impacts; minimize impacts to adjacent lands from weed infestations on FWP properties; and provide consistency in noxious weed management across the state. Environmental Assessments for noxious weed management have been completed and are on file for each FWP administrative region.

In accordance with the Montana Weed Management Plan (Montana Dept. of Agriculture, 2008), FWP emphasizes an integrated approach to weed management. Site conditions for each managed site are evaluated individually. Weed management practices include cultural, mechanical, biological and chemical control methods. Priority is assigned to weed-infested sites based on the following:

Priority 1 (highest priority): Early detection and rapid control of new invaders and newly established infestations.
Priority 2: Complete control or eradication of established priority noxious weeds occurring as scattered, satellite infestations.
Priority 3: Control of noxious weed seed production in high public use areas to prevent spread.
Priority 4: Containment/control of relatively large-scale weed infestations in areas with critical habitat or sites adjacent to cooperative weed management areas.

The FWP Regional Weed Coordinator(s) will compile and submit through the county, a biennial report outlining weed control activities for all FWP properties in the county, to the State Weed Coordinator (Department of Agriculture) in accordance with MCA 7-22-2151.

Proposed Operation Plan and Control Priorities for 200__ – 200___ biennium
FWP owns/leases ____ state parks (SP), ____ Fishing Access Sites (FAS), and ___ Wildlife Management Areas (WMA) within _____ County; SP and FAS sites are directly managed and budgeted by the Parks division while WMA sites are directly managed and budgeted by the Wildlife division.

County Specific Narrative
Use this space to document any special or planned activities specific to the coming year or biennium.

Sites and Legal Descriptions

Site	Legal Description	Acres Deeded	Acres Leased

Weed Status
Noxious weed species known to be present on FWP owned or managed lands within this county include:

Species	**Estimated Infested Acres**

Site Constraints
(Example Narrative: add to, modify, or delete as needed) Herbicide treatment of noxious weeds at is constrained by the presence of surface waters and by moderately permeable soil textures which could transport chemicals to shallow, seasonal groundwater tables or in the instance of steep upgrade terrain and coulee areas could possibly transport chemicals to the water body by runoff events. Herbicide treatments are also constrained in developed areas by high levels of human use, particularly during the summer months.

Herbicide treatments of noxious weeds at _____ are constrained on those portions of the park bordering the _____ Creek. This is due to the presence of surface water sources and moderately permeable soils.

Risks will be reduced and mitigated by careful consideration of herbicide choices for "sensitive site locations" on a case-by-case evaluation. Proper herbicide application rates and selecting herbicides labeled for those locations will be utilized to further ensure compatibility with site constraints.

Budget
Fiscal year budget amount for weed control on FWP sites within this county and performed by the County:

Site	**Budget**

The county weed coordinator agrees to contact FWP in advance of exceeding this agreed upon budget. Any costs incurred beyond this amount will be the responsibility of the county without such notification. Upon notification of an anticipated over run, FWP will work with the county to meet the increased budget need.

☐ I have reviewed the Biennial Weed Management Agreement and agree with the outlined plan of action to address weed infestations on FWP sites within my county with no further comment.

☐ I have reviewed the Biennial Weed Management Agreement and agree with the outlined plan of action to address weed infestations on FWP sites within this county, but have the following comments:

_____
_____
_____

(attach separate sheet if additional space is needed)

_____ _____
County Weed Coordinator Date

_____ _____
FWP Representative Date

APPENDIX E. PREVENTION STRATEGIES – EXECUTIVE SUMMARY[12].

Elements of a proactive weed prevention plan include:

- Identify sites that are not infested by noxious weeds and prioritize these for prevention efforts
- Limit introduction of weed seeds into an area;
- Implement early detection and eradication of small patches of weeds;
- Minimize disturbance of desirable vegetation along roadsides, trails, and waterways;
- Manage land to build and maintain healthy communities of native and desirable plants to compete with weeds;
- Systematically monitor high-risk areas such as human and animal transportation corridors and disturbed or bare ground;
- Revegetate disturbed sites with desirable plants; and
- Evaluate plan annually.

Invasive Plant Prevention: Lands

Site-Disturbing Projects and Maintenance Programs

Managers with FWP will incorporate weed prevention and control into project layout, design, and evaluation when planning projects that will disturb vegetation resulting in bare ground. Consideration will be made on conserving and enhancing the integrity and productivity of soil resources, and rebuilding or maintaining healthy plant communities that compete with weeds after the disturbance.

- Environmental analyses for projects and maintenance programs should assess weed risks, analyze high-risk sites for potential weed establishment and spread, and identify prevention practices.
- Include site-specific vegetation monitoring in project plans.
- Learn to recognize desirable plants as well as weeds.
- Before ground-disturbing activities begin, inventory and prioritize weed infestations for treatment in the project operating areas and along access routes. Ideally, weeds should be managed three to five years prior (minimum one year prior) to the planned disturbance to minimize weed seeds in the soil.
- Begin project operations in non-infested areas. Restrict movement of equipment or machinery from weed-contaminated areas to non-contaminated areas.
- Locate and use weed-free project staging areas, avoid or minimize travel through weed-infested areas, or restrict travel to those periods when spread of seed or propagules is least likely.
- Identify sites where equipment can be cleaned.
- Clean all equipment before leaving the project site if operating in areas infested with weeds.
- Inspect, remove, and properly dispose of weed seed and plant parts found on clothing and equipment.
- Evaluate options to regulate the flow of traffic on sites where desired vegetation needs to be established or maintained.
- Salvage weed-seed-free topsoil to use in restoring sites once disturbance activities have been completed.

Prevent the introduction and spread of weeds caused by infested topsoil, sand, gravel, and fill material.

- Use only weed-seed free mulch and straw on projects. List of growers for weed-free materials is available [Online] http://agr.state.mt.us/weedpest/pdf/nwsff_06list.pdf.
- Inspect other materials at the source to ensure that they are weed-free before transport and use.

[12] These strategies are summarized from the Invasive Plant Prevention Guideline published by the Center for Invasive Plant Management (CIPM), and slightly adapted to meet FWP needs. A complete guide is available through CIPM at www.weedcenter.org.

- When material from a weed-infested but herbicide-treated source is used in a project, inspect and document the project area annually for at least three years to ensure that any transported weeds are promptly detected and controlled.
- Maintain stockpiled, non-infested material in a weed-free condition.

Avoid creating environmental conditions that promote weed germination and establishment.

- Minimize soil disturbance.
- When working in vegetation types with relatively closed canopies, retain shade to the extent possible to suppress weeds and prevent their establishment and growth.
- Retain native vegetation in and around the project activity as much as possible.

Where project disturbance creates bare ground, re-establish vegetation to prevent conditions that favor weeds.

- Revegetate disturbed soil to optimize establishment of desirable plants for that specific site.
- Revegetation may include topsoil replacement, planting, seeding, fertilization, liming, and weed-free mulching.
- Monitor sites where seed, hay, straw, or mulch has been applied. Eradicate weeds before they develop seed.
- Where practical, salvage weed-seed-free topsoil and replace it on disturbed areas such as road embankments or landings.
- Use local seeding guidelines to determine procedures and appropriate seed mixes.
- Inspect all ground-disturbing operations in noxious weed infested areas for at least three growing seasons following completion of the project.

Improve effectiveness of prevention practices through weed awareness and education.

- Educate people in weed identification, biology, impacts, and effective prevention measures.
- Provide proficient weed management expertise at each administrative unit of a public land management agency. Expertise means that necessary skills are available and corporate knowledge of ongoing weed management strategies is maintained.
- Develop incentive programs encouraging weed awareness, detection, reporting, and identifying new weed invaders.

Set the example; maintain weed-free administrative sites.

- Treat weeds at administrative and implement weed prevention practices to maintain sites in a weed-seed free condition.

Land Acquisition

- Conduct weed inventories of all lands considered for acquisition, sale, or exchange.
- Public land managers may include a weed prevention and control provision in new permits, easements, or leases.
- Include weed prevention measures, including project inspection and documentation, in operation and rehabilitation plans.
- To prevent conditions favoring weed establishment, minimize bare soil conditions and re-establish vegetation as soon as possible on disturbed or bare ground.
- Communicate and coordinate with the local county weed district or weed management area.
- Follow grazing guidelines if livestock will be allowed on the site.
- Control weeds on road and pubic access areas to reduce the spread of weeds throughout the site.

Roads and Utilities

- Develop Best Management Practices for road construction material sites, sand and gravel pits, mulch, and other material source sites.
- Clean all equipment before leaving a project site when operating in areas infested with weeds.
- Remove mud, dirt, and plant parts from project equipment with a power washer before moving it into a project area. Seeds and plant parts should be collected and incinerated.
- Communicate with the local weed district or weed management area about projects and best practices for prevention and develop cooperative strategies.

- To avoid weed invasion, protect and maintain self-sustaining, healthy plant communities whenever possible.
- Periodically inspect roads and rights-of-way for noxious weeds.
- Schedule roadside mowing to have the greatest impact on noxious weeds (late bud to early bloom growth stage) and minimize impact to desirable grasses.
- Coordinate blading or pulling of noxious weed-infested roadsides or ditches in consultation with the local weed specialist. Areas where vegetation is removed by blading should be reseeded to resist weed invasion.
- Avoid acquiring water for road dust abatement where access to the water is through weed-infested sites.
- Treat weeds in road decommissioning and reclamation projects before roads are made impassable.

Recreation (Uplands)

- Post weed identification, awareness, and prevention practices at strategic locations such as trailheads, roads, and other information kiosks. Awareness messages can include some of the following examples:
    - Avoid moving through weed infestations whenever possible.
    - Inspect and clean motorized and mechanized trail vehicles of weeds and their seeds at a controlled site.
    - Wash boots before hiking into a new area. Inspect and clean packs, equipment, bike tires.
    - Keep dogs and other pets free of weed seeds.
    - Avoid picking unidentified "wildflowers" and discarding them along trails or roadways.
    - Inspect, brush, and clean animals (especially hooves and legs) before entering public land. Inspect and clean tack and equipment.
    - Tie or hold stock in ways that minimize soil disturbance and avoid loss of desirable native vegetation.
    - Enter public trails with clean shoes and clothing. Clean dogs if there is a possibility they are carrying weed seeds.
    - Thoroughly clean bicycles prior to using public trails.

- Provide weed identification information at trailheads. Encourage trail-users to hand-pull and bag taprooted weeds when found.
- Weed prevention messages should include information about where to report sightings of weeds.
- Work with sportsman/recreation groups such as Montana Outfitters and Guides Association, Trout Unlimited, Ducks Unlimited, Wilderness Society, etc, to provide invasive plant information to their membership.
- Require weed seed-free feed, hay, straw, and mulch on FWP sites.
- Maintain trailheads, boat launches, outfitter and public camps, picnic areas, airstrips, roads leading to trailheads, and other areas of concentrated public use in a weed-seed free condition.
- Regularly inspect for noxious weeds at trailheads, campsites and other staging areas for travel in undeveloped natural areas.
- In areas susceptible to weed infestation, limit vehicles to designated, maintained travel routes.
- Monitor for and eradicate new weeds promptly.
- Foster and support cooperative weed prevention areas to maintain common weed-free areas.
- Recreation permits and hunting and fishing licenses should include weed prevention guidelines and/or information on weeds that hunters and fishermen are likely to encounter.
- Tie-up sites for recreational livestock should be located away from water and in shaded areas where the low light helps suppress weed growth.

Invasive Plant Prevention: Water

Aquatic Recreation

- Post weed awareness messages and prevention practices at kiosks located at watercraft-launching facilities. Guidelines can include some of the following examples:
    - Before transporting to new waters, rinse boat and boating equipment with hot (40°C or 104°F) clean water, clean boat or trailer with a pressure washer.
    - Wash and dry fishing tackle, downriggers, float tubes, waders, and other equipment to remove or kill harmful species not visible at the boat launch.

- Avoid running personal watercraft through aquatic plants near boat access locations. Instead, push or winch watercraft onto the trailer without running the engine.
- Waterfowl hunters may use elliptical, bulb-shaped, or strap anchors on decoys because these types of anchors avoid collecting submersed and floating aquatic plants.
- Drain the water in bait buckets, live wells, and transom wells on land or back into the water from which it was taken.
- Avoid dumping aquarium water or aquatic plants into local waters.
- Inspect seaplanes and remove weeds from floats, wires, cables, water rudders, and pump floats; wash with hot water or spray with high-pressure water, or dry for at least five days.
- Avoid taxiing seaplanes through heavy surface growths of weeds before takeoff; raise and lower water rudders several times to clear off plants.
- Divers should clean their equipment after each use in water heated to at least 140° F and everything should be allowed to dry completely between dives.

- Consider providing proper washing equipment at major watercraft-launching sites.
- When feasible, inspect boats (including air boats), trailers, and other boating equipment and remove any visible plants, animals, or mud before leaving any waters or boat-launching facilities.
- FWP will clean watercraft used by FWP employees to minimize weed spread.
- When feasible, maintain a l00-foot weed-free clearance around boat launches and docks.
- Promptly post sites if aquatic invasive weeds are found. Confine an infestation; where prevention is infeasible or ineffective, close the facility until the infestation is contained.
- When feasible, construct new boat launches and ramps at deep-water sites. Restrict motorized boats in lakes near areas that are infested with weeds.

Watershed Management

- Frequently and systematically inspect and document riparian areas and wetlands for noxious weed establishment and spread. Eradicate new infestations before they become established – effective tools for riparian-area management are limited.
- When possible, maintain conditions (for example, water levels) that sustain desired riparian plant systems that compete effectively with weeds.
- Promote dense growth of desirable vegetation in riparian areas to minimize the availability of landing and germination sites for weed seeds and propagules that might be produced upstream.
- Address noxious weed risks in watershed restoration projects and water quality management plans.
- Pay particular attention to practices listed under “Site-disturbing Projects and Maintenance Programs” in this document.

Invasive Plant Prevention: Animals

Grazing Management

Incorporate noxious weed prevention and control practices in the management of grazing allotments. Promote grazing practices that minimize impacts on desirable vegetation.

- Consider prevention practices and cooperative management of weeds in grazing allotments. Proper grazing management and prevention practices may include:
  - Altering season of use (avoid grazing the same plants at the same time year after year)
  - Animal exclusion
  - Activities to minimize ground disturbance, especially in riparian areas
  - Preventing weed seed transportation on animals, humans, or equipment
  - Maintaining healthy, weed-free vegetation (consider proper stocking rates and allow plant recovery before re-grazing)
  - Managing weed infestations to limit weed seed dispersal into weed-free areas
  - Revegetation of sites susceptible to weed invasion
  - Frequent and systematic monitoring for new weeds
  - Reporting and follow-up management

- Ensure grazing allotment permittees are aware of the impacts of weeds and can identify weeds threatening the management area.

- Minimize transport of weed seed into and within allotments.
- If livestock may contribute to seed spread in a weed-infested area, schedule livestock use for prior to seed-set or after seed has fallen.
- Consider implementing prescribed/targeted grazing with domestic sheep or goats on weed-infested sites to minimize flowering and seed production in weeds.
- If livestock were transported from a weed-infested area, annually inspect and treat entry areas for new weed infestations.
- Avoid moving livestock from weed-infested sites to weed-free rangeland.
- Close infested pastures to livestock grazing when grazing will either continue to exacerbate the condition or contribute to weed spread.
- Provide supplemental feeding in a designated area so new weed infestations can be detected and treated quickly.
- Weed seed can be introduced into weed-free rangeland by passing through the digestive tracts of livestock. Keep new livestock (especially livestock that may have been fed poor-quality hay) in a holding field a minimum of 24 to 48 hours before releasing onto open range.
- Maintain healthy, desirable vegetation that resists weed invasion, establishment, and growth.
    - Manage timing, intensity (utilization), duration, and frequency of livestock activities to maintain vigor of desirable plants and retain live plant cover and litter to minimize exposed soil.
    - Manage livestock grazing in restoration areas to ensure that desired vegetation is well established.
    - Reduce ground disturbance.
    - Inspect areas of concentrated livestock use for weed invasion. Inventory and manage new infestations.
    - Use education programs or annual operating instructions to increase weed awareness and prevent weed spread associated with livestock management.

Wildlife

- Periodically inspect and document areas where wildlife concentrate in the winter and spring that might result in overuse, soil scarification, and weed establishment.

Invasive Plant Prevention: Fire

Wildfires require immediate action. Therefore, it's important to plan weed management strategies, prepare equipment, and educate firefighters *before* emergency situations strike. In the case of controlled, prescribed burns, developing and following guidelines for noxious weed prevention and control are critical.

Fire Planning

Improve effectiveness of prevention practices through weed awareness and education.

- Increase weed awareness and weed prevention in all fire training. Note that fires can increase soil nitrogen, decrease shade, and decrease competition from desirable plants – all conditions that favor weed invasion.
- Provide weed identification aids.
- For prescribed burns, inventory the project area and evaluate potential weed spread with regard to the fire prescription. Areas with moderate to high weed cover should be managed for at least two years prior to the prescribed burn to reduce the number of weed seeds in the soil. Vigilant weed management will be necessary after the burn.
- When possible, avoid weed infestations or remove source of weed seed (through mowing) when locating base camps, helibases, and staging areas.

Fire-Fighting

Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds.

- Ensure that all equipment has been thoroughly cleaned and is free of weed seed and propagules.
- Designate equipment-cleaning sites. Inspect and treat weeds that establish at equipment-cleaning sites after fires.
- When possible, use fire suppression tactics that reduce disturbances to soil and vegetation.
- Avoid moving water buckets from aquatic-weed-infested lakes to lakes that are not infested. There is no hazard in using water infested with aquatic weeds on terrestrial sites.
- Given a choice of tactics, avoid ignition and burning in areas at high risk for weed establishment or spread.

Fire Rehabilitation

To prevent conditions favoring weed establishment, revegetate disturbed ground that is unlikely to recover to desired plants naturally as soon as possible following fire. Use certified weed-free seed mixes.

- To prevent weed spread, treat weeds in burned areas. Weeds can recover as quickly as two weeks following a fire.
- Weed-free or relatively weed-free burned areas should be monitored for weeds the following growing season.
- Determine soon after a fire whether revegetation is needed to speed recovery of a competitive plant community, or whether desirable plants in the burned area will recover naturally. Consider the severity of the burn and the proportion of weeds to desirable plants on the land before it burned. In general, more severe burns and higher pre-burn weed cover increase the necessity of revegetation. Consider revegetating an area if the desired plant cover is only 20 to 30%.
- Monitor, document, and treat weeds at fire access roads, cleaning sites, fire lines, staging areas, and within burned areas. Control infestations to prevent spread within burned areas; control nearby infestations to prevent spread into burned areas.
- Seed and straw to be used for burn rehabilitation (wattles, straw bales, dams, mulch, etc.) should be certified free of weed seed and propagules.
- Defer livestock grazing in burned areas until vegetation has successfully reestablished, usually after two growing seasons. Restrict travel to established roads to avoid compacting soil that could hinder the recovery of desired plants.
- Request assistance from county weed coordinator to review burned area rehabilitation reports to ensure proper and effective weed prevention and management is addressed.
- Develop a burned-area integrated weed management plan, including a monitoring component to detect and eradicate new weeds early.

APPENDIX F. CONTACT INFORMATION/RESOURCES FOR BIOLOGICAL CONTROL AGENTS

Biological control is the use of insects and/or pathogens for control of noxious weeds. There are many approved biological control agents available for noxious weeds in Montana. Resources regarding biocontrol agents, availability for collection and redistribution, and effectiveness are described below.

A biocontrol "release" is defined as an adequate number of insects released at the same time in a suitable habitat that allows insects to establish and reproduce. Insects released in either a new location, or on a site where the existing insect population is inadequate will be considered a new release by FWP. The minimum number of insects per release is 100 with the following exceptions:

Cyphocleonus achates (knapweed root weevil) 50 insects/release
Aphthona sp. (leafy spurge flea beetles) 250-1000 insects/release

Book Reference: Biological Control of Invasive Plants in the United States. 2004. eds. E.M. Coombs, J.K. Clark, G.L. Piper, and A.F. Cofrancesco, Jr. Western Society of Weed Science. OSU Press. Available [Online] http://www.wsweedscience.org.

In this book, leading experts review the discipline of biological control of invasive terrestrial and aquatic plants. Topics addressed include ecology, safety testing, non-target impacts, and the processes of identifying, introducing, distributing, and monitoring biological control agents.

Agencies Providing Information and/or Assistance with Collection and Redistribution of Biological Control Agents:

- County Weed District Coordinators (phone numbers available at www.mtweed.org)
- MSU Cooperative Extension Service (phone numbers available at www.mtweed.org)
- Animal Plant Health Inspection Service; Directors office (406) 449-5210
- Montana Department of Agriculture (406) 444-3140 or 444-7819
- Montana Weed Control Association www.mtweed.org . Contact: Jim Larson – biological control committee (406) 321-2270
- Montana State University Western Ag. Experiment Station. Jim Story. (406) 961-3025.

APPENDIX G. FWP STANDARDS FOR GRAZING LIVESTOCK

The Landowner expressly reserves the right to raise, pasture and graze livestock in accordance with the following terms and conditions.

Prior to grazing livestock on the Land, the Landowner and Department must agree upon and implement a grazing plan that includes a map of the pastures involved, a grazing formula specific to those pastures, the class of stock, and other information pertinent to the grazing system and Conservation Easement. The grazing plan will be included as part of the Management Plan, and will define the limits and extent to which grazing may occur until such time as the Management Plan may be amended by mutual consent, as more particularly described in Paragraph II.E. of the Conservation Easement. The grazing plan will consider the entire, year-round, livestock operation. Any pastures that exist beyond the boundaries of the easement area will also be considered to ensure that the year-round needs of livestock and the ranch are met. The terms of the Conservation Easement will be enforceable only on the Land described in this easement.

For upland pastures in native plant communities (i.e., generally on soils that have never been plowed), and for all riparian pastures, the grazing plan must meet or exceed minimum levels of periodic rest from livestock grazing to allow native plants adequate opportunity to reproduce and replenish root reserves. The minimum amount of rest required for any pasture that is grazed in one year during the plant growing season is defined as rest throughout the next year's growing season (i.e., grazing deferred until seed-ripe), followed by one year of rest yearlong, as shown in the table below. The pasture would then be available again for livestock grazing during the season in the fourth year. The growing season is defined as beginning with the period of rapid plant growth (generally early to mid-May) until seed-ripe for the latest maturing native grasses, such as bluebunch wheatgrass or western wheatgrass (generally early August).

Livestock Grazing Formula

Grazing Seasons	Pasture 1	Pasture 2	Pasture 3
Year One	A	B	C
Year Two	B	C	A
Year Three	C	A	B
Year Four the rotation is started over by referring to Year One.			
A = livestock grazing allowed during the growing season; B = livestock grazing begins after seed-ripe time; C = rest from livestock grazing yearlong.			

A three-pasture grazing system is used as an example to show how the Landowner might typically rotate livestock through pastures to meet the minimum levels and required sequence of rest from livestock grazing. In practice, the Landowner is not limited to any particular number of pastures on the Land, but if livestock are grazed on the Land, they must be moved through the pastures in compliance with these standards and the grazing plan.
If livestock are to be grazed in a native range or riparian pasture in winter or early spring (generally December through early May), a separate grazing formula is required that is coordinated with the summer-fall grazing system and provides adequate rest. Minimum required rest in pastures where livestock are grazed and/or fed hay during winter is one winter of rest in every two years. Hay, grain, salt, protein or other supplements will not be placed in riparian areas during winter or any other season. Minimum required rest in pastures where livestock are grazed in spring, prior to early May, is one spring of rest in every two years. Any pastures grazed later in spring than early-mid May require the greater amount of rest shown in the table above.

Standards for periodic rest from livestock grazing shall not be interpreted to prevent the Landowner from maintaining and using corrals or other portions of pastures on the Land for seasonally gathering and working livestock as necessary, but the location and prescribed use of such areas will be identified and controlled by the grazing plan, and limited to the minimum necessary sizes on suitable sites.

APPENDIX H. MOWING GUIDELINES: FOR NON-TURF GRASS SITES, ROADSIDES, PUBLIC ACCESS SITES.

Activity Description
This activity includes mechanical mowing of vegetation for public access sites, along roadsides, and other non-turf grass areas. Mowing will be conducted to ensure safe, functional, and healthy vegetated sites that resist weed invasion. The default decision of the manager will be to NOT mow, unless vegetation is causing a concern that needs to be addressed, such as public access or safety. These mowing guidelines do not include managed turf such as around buildings.

Purpose Statement
The ultimate goal of vegetation management is to produce a healthy, low-maintenance, self-sustaining sites by encouraging desirable vegetation.

Mowing may be used to:
- Improve public access for recreational activities,
- maintain safe sight distances on roadsides,
- reduce seed production in noxious and nuisance weeds,
- reduce potential for snow drifting,
- improve aesthetic values and improve visibility of signs,
- comply with public concerns regarding vegetation management

Timing of Maintenance

Safety concerns take precedence over any of the other listed mowing purposes. If adequate sight distance for the traveler on roadsides is limited by tall vegetation, mowing should take place regardless of other considerations. Traditionally, roadsides, campgrounds, and other public use areas have been mowed based on aesthetics or a timetable rather than to meet specific vegetation management objectives. Mowing after cool-season grasses reach dormancy (usually after July 15) will encourage the development of healthy, desirable vegetation that will compete with noxious weeds.

Specialized Equipment
- Mowers or brush cutters
- Truck mounted attenuator (TMA)
- Hand operated mowers and weed trimmers

Safety and Training
Supervisors should discuss safety hazards of mowing and use appropriate equipment and protective clothing.

Environmental Best Management Practices

- Mow only those areas needed for public safety or access, or to reduce noxious weed seed production.
- Mowing height should never be less than 6 inches. This mowing height will reduce plant shock and root dieback of desirable species. The following can occur if roadside vegetation is cut too short (scalping) during the growing season.
    - Soil temperature and erosion increases

    - Desirable vegetation experiences reduced vigor, lowering tolerance to drought, and vulnerability to high-maintenance noxious and nuisance weed growth.
- Mowing during the growing season for desirable species opens the shade canopy and encourages weed growth.
- Mowing as a weed management tool should be timed so that desirable vegetation is at the late seed production stage, and noxious weeds are at late bud to early bloom growth stage.
- Clean equipment used in mowing and brush cutting activities on a regular basis. A mower will spread weed seeds when mowing through an infested area. Each mower should be cleaned by power washing prior to transferring the mower between weed infested and non-infested sites or when moving between counties.

Procedures

- Develop timing schedules for mowing noxious weeds to reduce and/or stop seed production (CWD can provide local information on weed growth stage and optimum time for mowing operations).
- Inspect areas to be mowed for debris and other hazards or obstructions. Remove debris to prevent items from becoming projectiles. Hazards and obstructions should be marked and may include culverts, concrete head-walls, flared ends, drop inlets, splash basins and washouts.
- Mowing widths on roadsides should be no greater than that needed for public safety unless some specific problem or goal exists. It is not FWP intent to mow all sites.
- Check condition of equipment and complete required pre-operational inspections and daily operational servicing. Check to make sure equipment is set for appropriate mowing heights. Minimum mowing height is six inches (6”).
- Particular attention should be given to visibility concerns at roadway intersections and approaches.

APPENDIX I. MULCHING AND EROSION CONTROL

Mulch is a non-living material placed on the soil surface primarily to protect the soil from wind and water erosion, facilitate infiltration, reduce evaporation, and moderate soil temperatures. Mulching generally can improve overall germination and seedling establishment and protect soil resources. Specific site conditions need to be examined to determine the potential effectiveness of mulch. Soil moisture and organic matter, soil erosion and crusting potential, and presence of high winds should be considered to determine if mulching is necessary. Any mulch sources that are applied should be certified free of noxious weed seed. Montana Department of Agriculture maintains a list of producers that provide weed-seed free mulch/straw available [Online] at http://agr.state.mt.us/weedpest/pdf/nwsff_06list.pdf.

Straw mulches consisting of wheat, barley, and/or oats are the most common mulches. Application rates can vary, but average 2 tons per acre. Only certified weed free straw should be used to prevent introduction of noxious weeds. Stems need to be as long as possible to increase life expectancy as mulch. Straw can be placed on the site by hand or with a blower for large areas. Straw mulch often needs to be anchored to prevent being blown away or washed away by overland water flow. The use of tackifers, plastic, or biodegradable netting is an effective way to retain straw on the site. Mechanical crimpers have also been used to push straw into the soil surface on sites where use of heavy equipment is feasible.

Native hay mulches have also been used but often contain high levels of noxious weed seed or other non-desirable plant species. Only native hay certified noxious weed free, and contains desirable species should be used. Under these conditions, native hay can result in increased diversity of the resulting plant community.

Hydromulching with wood fiber or paper in a water slurry is another form of mulching. This requires the use of a machine called a hydromulcher or hydroseeder, and equipment access to the site. Wood fiber mulches are usually more effective than paper mulches because longer wood fibers adhere to soil and are more resistant to wind and water erosion. Hydromulch is often applied at average rates of 1,500 lbs. per acre and a tackifier can be used to help it stay on the slope. Incorporation of seed and fertilizer in the mix is not a good idea because some seed will not be in contact with the soil and can be lost to desiccation. Fertilizer in the slurry can create a high salt concentration that can reduce water adsorption and kill seed.

Woodchips, sawdust, and bark can also be used as mulch. These can be quite inexpensive if local sources are present. Wood residues are very long lasting compared to other mulches. However, nutrients like nitrogen can get tied up and immobilized in the wood during the decay process. The addition of fertilizer can help offset nitrogen deficiencies during decomposition.

The use of pre-made erosion control mats are also effective for revegetation and rehabilitation projects. These mats come in a variety of types, sizes, strengths and can be expensive. Mats made from straw and/or coconut fiber with biodegradable netting are rolled onto the site and secured with metal staples. Stronger mats, either pure coconut fiber or synthetic fibers, need to be used on sites with high erosion hazards, high velocity overland flow rates, or steep slopes.

Mulching after seeding can improve revegetation success by keeping seed in contact with soil, moderating temperatures, and reducing water loss necessary for seed to germinate. Mulching around planted seedlings can also improve water availability and provide protection from inclement environmental conditions.

APPENDIX J. POSTING NOTICE (HERBICIDE USE)

Herbicide applications made on FWP owned and managed lands with high public use (for example, administrative areas, developed campgrounds, and trailheads) will be posted a minimum of one day prior to, during, and for a minimum of 48 hours following an application. Developed campgrounds will be closed to the public while herbicide applications are made, and the site posted for a minimum of 48 hours following application. A posting notice (shown below) will be used to mark areas scheduled for herbicide application. This notice must be laminated or otherwise protected from weather, and be placed in a prominent location to be visible to the public.

There are some cities and towns in Montana that require posting for herbicide application. City/county administrators will be contacted by FWP or their contractor to determine herbicide application posting requirements for FWP properties located within jurisdictional boundaries of city/towns, and follow posting requirements when applying herbicides.

Sample: Herbicide Posting Notice

Notice and Caution: Herbicide Application

Herbicide in use: *common name and trade name (i.e. Milestone; aminopyralid)*

Target weeds: *(name the weed/weeds)*

Proposed Schedule for Application (weather permitting): *(i.e. June 1 to June 15: not including weekends)*

Application Date: *actual date application was made*

For more information contact: *Name, phone, and email address*

- The Montana Fish, Wildlife and Parks (FWP) are using these herbicides to control invasive, noxious weeds.
- Noxious weeds are one of the top threats to conservation of biodiversity in North America
- FWP also uses biocontrol insects, hand pulling, cultivation, grazing, mowing, and revegetation as part of an integrated weed management program.
- For more information on FWP land management program, visit the website at http://fwp.mt.gov/

Notice and Caution:
Herbicide Application

Herbicide in Use:_____

Target weeds:_____

Proposed Schedule for Application (weather permitting)

_____EXCLUDING WEEKENDS

Application Date: _____

For more information contact:

_____

- Montana Fish, Wildlife and Parks (FWP) are using these herbicides to control invasive, noxious weeds.
- Noxious weeds are one of the top threats to conservation of biodiversity in North America
- FWP also uses biocontrol insects, hand pulling, cultivation, grazing, mowing, and revegetation as part of an integrated weed management program.
- For more information on FWP land management program, visit the website at http://fwp.mt.gov/

APPENDIX K. SPRAYER CALIBRATION GUIDE

Calibrating backpack sprayers or hand guns

Backpacks or hand gun spray equipment, with one nozzle located at the end of a wand, are used for spot treating small infestations or in rugged terrain where other application methods are not possible. Over-application with this equipment is a common occurrence so calibration is critical. When calibrating your sprayer, select an application style that gives the best coverage. This is normally a gentle side-to-side sweeping motion that covers the ground as you walk away from the spray solution. You may want to practice on a hard, clean surface that will show your application pattern before actually calibrating the sprayer. Remember to keep pressure constant during calibration and field application. ***Note: You must use the same application technique during calibration as you use during a field application. If you vary speed or pressure, it will affect your sprayer output and thus the herbicide application rate.***

This method of calibrating backpack or hand gun equipment involves very little math or formulas. It is based on the following principal: one gallon = 128 ounces and the test area to be sprayed is 1/128 of an acre, thus ounces collected = gallons per acre.

Step1. Measure an area 18.5 by 18.5 feet which is equal to $1/128^{th}$ of an acre. This should be done in the field on weed-infested terrain similar to where you plan to make the herbicide application.

Step 2. Spray the measured area uniformly with water – the way you normally spray - recording the number of seconds required to spray the area in step 1. During application be sure to maintain a constant sprayer pressure. The use of a marker dye (Highlight or equivalent) helps the applicator apply a uniform spray pattern. Repeat several times and take the average time.

Step 3. Spray into a container for the same amount of time it took to spray the measured area. Be sure to maintain constant sprayer pressure.

Step 4. Measure the number of ounces of water in the bucket.

Step 5. The number of ounces collected from the bucket is equal to the number of gallon per acre the sprayer is delivering.

Volume Sprayed _____ ounces = Gallons Per Acre (GPA)

Step 6. Add the proper amount of herbicide to the tank. For backpack sprayers, use the following table to determine how much liquid herbicide to add to each gallon of water. Find your spray volume in gallons per acre and read across the chart to determine the amount of herbicide to add to each gallon of water.

Table 1: The amount of herbicide you need to add to <u>each gallon</u> of water based on the recommended rate for the weed you are treating.

Gallons/Ac (from step 5)	Recommended Herbicide Rate/Acre				
	7 fl oz/ac	1 pint/ac	1 quart/ac	2 quarts/ac	3 quarts/ac
20	2 tsp/gal	5 tsp/gal	10 tsp/gal	3 1/4 fl oz/gal	4 3/4 fl oz/gal
30	1 1/2 tsp/gal	3 tsp/gal	6 tsp/gal	2 fl oz/gal	3 1/4 fl oz/gal
40	1 tsp/gal	2 1/3 tsp/gal	4 3/4 tsp/gal	1 2/3 fl oz/gal	2 1/3 fl oz/gal
50	3/4 tsp/gal	2 tsp/gal	3 3/4 tsp/gal	1 1/4 fl oz/gal	2 fl oz/gal
60	2/3 tsp/gal	1 2/3 tsp/gal	3 1/4 tsp/gal	6 1/3 tsp/gal	1 2/3 fl oz/gal
70	2/3 tsp/gal	1 1/3 tsp/gal	2 3/4 tsp/gal	5 1/2 tsp/gal	1 1/3 fl oz/gal
80	1/2 tsp/gal	1 1/4 tsp/gal	2 1/3 tsp/gal	4 3/4 tsp/gal	7 1/4 tsp/gal

Liquid conversions: tsp = teaspoons; TBS = tablespoons; fl oz = fluid ounces
3 teaspoons = 1 tablespoon 8 fluid ounces = 1 cup
2 tablespoon = 1 fluid ounce 1 cup = 16 tablespoons

Example: *You calibrate your sprayer and the output is 30 GPA, and your sprayer holds 3 gallons. The label requires a herbicide application rate of 1 pint/acre for the target weed. Go to the chart and read across from 30 Gal/A - the amount of herbicide to add to each gallon of water is 3 teaspoons. Since your sprayer holds 3 gallons of total solution you would add 9 teaspoons of herbicide to 3 gallons of water in each backpack tank.*

Some herbicides such as Cimarron (metsulfuron) are dry rather than liquid formulations. These herbicides will come with a small measuring device with directions on how much to add to your tank based on your application rate.

For sprayers larger than 10 gallons follow this example: You calibrate your hand-gun sprayer and the output is 100 gpa, and your sprayer hold 50gallons. The amount of area you can treat with a full tank of spray solution is ½ acre. The label requires an herbicide application rate of 1 quart per acre for the target weed. You would add one pint of herbicide to your spray tank since you are only treating ½ acre with a full tank of solution.

Calibrating boom-buster or boom-i-nator spray equipment with a refill method.

The refill method of calibration is simple and easy to understand. This should always be done in the field on terrain similar to where you plan to make the herbicide application. Field surface conditions can greatly affect sprayer speed, which in turn affects application rate. Basic steps for the refill method are as follows.

Step 1. Park the sprayer on level ground, then **fill the spray tank with water to an easily determined point** (mark this on the tank).

Step 2. Adjust the pressure to recommended level. Most nozzles work best between 30 and 35 psi (pounds per square inch).

Step 3. Select a speed that can be easily maintained for field conditions. Field conditions will have a large effect on speed, which affects application rate. For example a sprayer calibrated at 4 mph but driven at 3 mph will over-apply by 33% potentially damaging non-target vegetation!

Step 4. Spray a measured area (spray swath width and length). Measure a length to spray -such as 200 feet- and drive that length at a speed that negotiates terrain and minimizes drift. Measure the spray swath width during this step.

Step 5. Return to the filling point. Be sure to park equipment in the same location to refill the tank.

Step 6. Measure the amount of water required to refill the tank. Use a calibrated pail so you can accurately measure water required to fill the sprayer to the original mark.

Step 7. Calculate the spray rate. The final step is to determine the spray rate; in this case it will be in gallons per acre (gpa).

$$GPA = \frac{\text{gallons sprayed [from Step 6] X 43,560 sq/ft/acre}}{\text{swath width (ft) X swath length (ft) [as measured in Step 4]}}$$

Step 8. Add the proper amount of herbicide to the tank. *Example: Your spray tank holds 30 gallons total. If you want to apply one pint of herbicide per acre, and your spray rate is 15 gallons per acre (as calculated in Step 7), then you would add two pints of herbicide to the tank since you can treat 2 acres with a full tank of solution.. The best way to mix is to add half of the amount of water to the tank, then add the herbicide, then fill the sprayer with water to the 30-gallon mark.*

APPENDIX L. SAMPLE HERBICIDE APPLICATION RECORD

Available [Online] http://www.agr.mt.gov/pestfert/miscpdf/RecordKeepingForm.pdf

Compliments of the

MONTANA DEPARTMENT OF AGRICULTURE
AGRICULTURAL SCIENCES DIVISION
P0 BOX 200201
HELENA, MT 59620-0201
Phone: 406-444-3730

DAILY PESTICIDE APPLICATION RECORD

BUSINESS	LICENSE#
NAME	ADDRESS
CITY, STATE, ZIP	PHONE

CUSTOMER_____ PHONE_____

ADDRESS_____.

	APPLICATION #1	APPLICATION #2
Applicator/Operator Name		
Date		
County		
Time Start/Stop		
Temperature		
Wind Speed/Direction (from)		
Pesticide Manufacturer		
Trade Name		
EPA Reg# or Formulation		
Rate: Product/Diluent Per Acre		
Crop or Site & Crop Stage		
Pest(s)		
Equipment Used		
Acres/Area Treated		
Location #1 Location #2	COMMENTS/MAP:	

Appendix M: Herbicide application rate and time of application to provide optimum noxious weed control on range, pasture, and wildland areas in Montana (Scientific names of weeds are shown in Appendix A).

Weed Species	Plant biology	Herbicide (trademark)	Herbicide[1] Rate/Acre	Herbicide Application Timing	Comments
Blueweed	Biennial/ Tap-rooted	Cimarron[2] or Telar	0.5 to 1 oz	Rosette to early bud; fall	Use with a non-ionic surfactant
Cinquefoil Sulfur (Erect)	Perennial/ Tap-rooted	ForeFront R&P	2 to 2.5 pints	Active growth	Can apply to waters edge – do not get in water
		Milestone	4 to 6 fl oz	Pre-bud	
		Tordon 22K	1 pint	Active growth	Do not apply to shallow groundwater areas
		2,4-D	2 quarts	Rosette to bud	Apply before flower growth stage
Common crupina	Annual/tap-rooted	Tordon 22K	1 pint	Rosette to bolt	Category 3 weed in MT, report to Dept of Ag.
		Transline	1 pint		
		2,4-D	2 quarts		
Common tansy	Perennial/ Rhizominous	Cimarron or Telar	0.5 to 1 oz	Bolt to bud	Use with a non-ionic surfactant
Dyers woad	Perennial/ Tap-rooted	Cimarron	0.5 to 1 oz	Rosette to bud	Use with a non-ionic surfactant
		Telar	0.5 to 1 oz		
Field bindweed	Perennial/Deep-rooted Rhizominous	Tordon 22K + 2,4-D	1 quart + 1 quart	12" of growth, or fall	Do not apply to shallow groundwater areas
		Tordon 22K	1 quart	12" of growth, or fall	
Hawkweed Meadow Orange	Perennial/Shallow-rooted/ Rhizominous	ForeFront R&P	2 to 2.5 pints	Bolt to bud	Can apply to waters edge – do not get in water Addition of N fertilizer may improve control. Treat outside of dripline of desirable trees
		Milestone	4 to 6 fl oz		
		Redeem	3 pints	Bolt to bud	Do not apply to shallow groundwater areas
Hoary alyssum	Biennial to perennial/Tap-rooted	Cimarron or Telar	1 oz	Rosette to late bud	Use with a non-ionic surfactant
		2,4-D+ dicamba	1 qt + 1 qt	Rosette to early bolt	
Houndstongue	Biennial/Tap-rooted	Cimarron or Telar	0.5 to 1 oz	Rosette to late bud	Use with a non-ionic surfactant
		2,4-D	2 quarts	Rosette	Must apply before bolting growth stage
Knotweed complex	Perennial/Rhizominous	Habitat	2 qts/ac	Cut plant to within 12" of ground prior to treatment	Caution: can cause injury to desirable trees/shrubs if root systems extend into treated area
		glyphosate	5ml/stem	Inject full strength	Must treat each stem – may need re-treatment
Knapweed Spotted Diffuse Yellow starthistle	Tap-rooted Perennial Biennial/perennial Annual	Milestone	5 to 7 fl oz	Actively Growing	Can apply to waters edge – do not get in water
		ForeFront R&P	2 pints		
		Curtail	2 quarts	Rosette to bud	Do not apply to shallow groundwater areas
		Tordon 22K	1 pint	Actively growing	
		Transline	2/3 pint	Rosette to bud	
		2,4-D	2 quarts	Rosette to bolt	Provides least effective control of herbicides listed

[1] Rate is based on amount of product/acre
[2] Metsulfuron, sold under trade names of Cimarron, Escort and others.

Weed Species	Plant biology	Herbicide (trademark)	Herbicide Rate/Acre	Herbicide Application Timing	Comments
Knapweed Russian	Perennial/Deep-rooted Rhizominous	Milestone	4 to 6 fl oz	Bolt to bud, or fall	Can apply to waters edge – do not get in water
		ForeFront R&P	2 to 2.5 pints	Bolt to bud, or fall	
		Tordon 22K	1 quart	Bud, flower, or fall	Do not apply to shallow groundwater areas
Leafy spurge	Perennial/Deep-rooted Rhizominous	Tordon 22K	1 to 2 quarts	Full flower or fall	Do not apply to shallow groundwater areas; retreat when control drops < 80%
		Tordon 22K + 2,4-D	1 to 2 pint + 1 quart	Full flower or fall; apply annually for 3 yrs	
		Plateau	8 to 10 fl oz	Fall or prior to first frost	Use with non-ionic or methylated seed oil surfactant
Loosestrife, Purple	Perennial/ Deep-rooted Rootstock	Garlon 3A	1.5% solution	Apply July through Aug.	Can use in aquatic sites
		Glyphosate (Aquamaster/ Rodeo)	2 quarts/ac or 2% solution	Pre-flower	Use aquatic label glyphosate such as Rodeo and add an approved surfactant. Use 2% solution + surfactant for spot spraying.
		Habitat	1 pint/ac	Actively growing	Can use in aquatic sites.
Oxeye Daisy	Perennial/Shallow-rooted/ Rhizominous	Cimarron	0.5 oz	Rosette to early flower	Use with a non-ionic surfactant
		ForeFront R&P	2 to 2.5 pints	Rosette to early flower	Can apply to waters edge – do not get in water , Addition of N fertilizer may improve control.
		Milestone	4 to 6 fl oz	Pre-bud	
Pepperweed, Perennial	Perennial/ Deep-rooted Rhizominous	Cimarron	0.75 to 1 oz	Bud to flower	Use with a non-ionic surfactant
		Telar	1 oz	Bud to flower	
		Plateau	10 fl oz	Flower	Use with a methylated seed oil surfactant @ 1 qt/ac
Rush skeletonweed	Perennial/ Deep-rooted Rootstock	Milestone	5 to 7 fl oz	Rosette to early bud	Category 3 weed in MT, contact Dept of Ag. Can apply to waters edge – do not get in water
		Tordon 22K	1 quart	Rosette to early bud;fall	Do not apply to shallow groundwater areas
		Transline	1 pint	Rosette to early bud;fall	
Russian olive Invasive in riparian areas County-listed weed	Woody tree	Arsenal	1% solution	Apply to foliage	Apply 1.3 oz herbicide/gallon water
		Remedy	25-30% solu. + basal oil	Basal bark treatment or apply to cut stump	Apply any time of year: see label for application instructions.
		Glyphosate	Full strength	Apply to cut stump	
St. Johnswort	Perennial/Deep-rooted Rhizominous	Tordon 22K	1 to 1.5 pint	Pre-flower	Do not apply to shallow groundwater areas
		Milestone	5 to 7 fl oz		
Tall buttercup	Perennial/ Rhizominous	ForeFront R&P	2 pints	Seedling to early flower	Can apply to waters edge – do not get in water
		Milestone	4 to 6 fl oz		
		MCPA Amine	2 quarts	Seedling to early flower	Treat annually for 2 consecutive years
Tamarisk Mature tree	Woody tree	Arsenal	1% solution	Apply to foliage	Apply 1.3 oz herbicide/gallon water
		Remedy	25-30% solu. +basal oil	Basal bark treatment or cut stump	Apply any time of year: see label for application instruction.

Weed Species	Plant biology	Herbicide (trademark)	Herbicide Rate/Acre	Herbicide Application Timing	Comments
Tansy ragwort	Perennial/Rhizominous	ForeFront R&P	2 to 2.5 pints	Seedling to pre-bud	Can apply to waters edge – do not get in water; will damage conifer trees
		Milestone	4 to 6 fl oz		
		Transline	1 pint	Actively growing	Clip flowers prior to treating to stop seed production – safe to use in conifer trees
		2,4-D	2 quarts	Seedling to rosette	Not effective when applied at flower stage – suppression only
Thistle, Canada	Perennial/Deep-rooted Rhizominous	Milestone	5 to 7 fl oz	Bolt to bud, or fall	Can use up to waters edge – do not get in water
		ForeFront R&P	2 to 2.5 fl oz	Bolt to bud, or fall	
		Redeem	3 to 4 pints	Bolt to bud	Do not apply to shallow groundwater areas
		Curtail	2 to 4 quarts	Bolt to bud	
		Tordon 22K	1 quart	Bolt to bud or fall	
		Transline	1 to 1.3 pints	Bolt to bud or fall	Can apply over conifers trees with no damage; do not apply to shallow groundwater areas
Toadflax Dalmatian Yellow	Perennial/Rhizominous	Tordon 22K	1 to 2 quarts	Flower or fall	Do not apply to shallow groundwater areas Use 2 qts on yellow toadflax for spot treatment
		Telar	1 oz	fall	Use with a non-ionic sufactant
		Tordon + Telar	1 quart + 1 oz	fall	Use with a non-ionic surfactant
		Plateau + MSO	12 ounces	fall	Results may be inconsistent; apply with MSO
Whitetop (hoary cress)	Perennial/Rhizominous	Cimarron	0.5 to 0.75 oz	Pre-bud to bloom (use higher rate at bloom)	Use with a non-ionic surfactant
		Telar	0.5 to 1 oz		
Yellow-flag iris	Perennial/ Rhizominous	Rodeo	8% solution	Bolt to flower – prior to full bloom	Use with an aquatic approved surfactant;

Appendix M: Manual, Mechanical, and Biological Management Methods for Noxious Weeds in Montana.

Weed Species	Hand-pulling/Digging	Tillage	Mowing	Biological Agents[3]
Blueweed	Plants can be dug successfully; remove at least 3" of root crown	Controlled by tillage	Reduces seed production if mowed at late bud growth stage; no plant control	No biocontrol agents available.
Cinquefoil, sulfur	Difficult to hand pull; digging is effective on individual plants	Controlled by tillage	Reduce seed production if mow at bud stage; no plant control	No biocontrol agents available
Common crupina[1]	Effective if remove upper 3" of root	Controlled by tillage	Not effective, plants regrow quickly and produce seed	No biocontrol agents available
Common tansy	Stops seed production, will not control plant	Tillage will spread root fragments	Mow at late bud growth stage to reduce seed production; no plant control	No biocontrol agents available
Dyers woad[1]	Remove upper 3" of crown to control plant by digging	Annual tillage will control in crop.	Reduce seed production if mowed at late bud stage, no plant control	Rust fungus (*Puccinia thlaspeos*) can reduce plant vigor; not suitable as control in MT
Field bindweed	Stops seed production, will not control plant	Tillage will spread root fragments	Not effective	Mite – available in TX; moth - unavailable
Hawkweeds[2]	Not effective, digging spreads root fragments	Tillage will spread root fragments	Not effective; stimulates lateral growth	Under screening and evaluation; no agents currently available
Hoary alyssum	Hand pulling effective on small, scattered infestations; remove at least 3" of root crown	Controlled by tillage	Reduce seed production if mow at bud stage; no control to very limited plant control	No biocontrol agents available
Houndstongue	Plants can be dug successfully; remove at least 3" of root crown	Controlled by tillage	Reduces seed production if mowed at late bud growth stage; no plant control	No biocontrol agents available in U.S.
Knapweeds – Spotted Diffuse	Hand pulling effective on small, scattered infestations; remove at least 3" of root crown	Controlled by tillage	Reduce seed production if mow at bud stage; no control to very limited plant control	13 insects introduced for biological management; insects established; reduction of infestations in some locations
Knapweed - Russian	Stops seed production, will not control plant	Tillage will spread root fragments	Reduce seed production if mow at bud stage; no plant control	A gall-forming nematode, *Subangina picridis*, has been released – limited impact
Knotweed complex	Large, extensive root system. Can dig newly established infestations. Must remove all root segments to control plant	Tillage will spread root fragments	Reduces seed production but my expand lateral growth	New invader; control infestations with other methods
Leafy spurge	Stops seed production, will not control plant	Tillage will spread root fragments	Must be mowed every 3 to 4 weeks to stop seed production; no plant control	13 agents available for release; *Aphthona sp*. most suited to effective IWM
Oxeye daisy	Individual plants can be dug successfully	Controlled with multiple tillage operations	Reduce seed production if mow at bud stage; may stimulate lateral growth	No biocontrol agents available

Weed Species	Hand-pulling/Digging	Tillage	Mowing	Biological Agents[3]
Purple loosestrife[1]	Difficult to dig; must remove all root fragments	Tillage will spread root fragments	Reduce seed production if mow at bud stage; may stimulate lateral growth	4 biocontrol agents available for release
Russian olive	Can be dug or pulled with mechanical equipment – difficult to remove	Tillage not effective	Tree can re-sprout above cut area	No biological agents available
Perennial pepperweed[2]	Stops seed production, will not control plant	Tillage will spread root fragments	Mowing 2 times per season stopped seed production (N. CA); no plant control	No biocontrol agents available
Rush skeletonweed[1]	Stops seed production, will not control plant unless done 2-3 times/yr for 6-10 yrs	Tillage spreads root fragments	Limits seed production in dry years; no plant control	3 insects available; 1 fungus
St. Johnswort	Only effective on young, isolated plants	Repeated tillage effective	Reduce seed production if mow at bud stage; no plant control	4 insects available; limited success in MT
Tall buttercup[2]	Individual plants can be removed by hand-pulling	Repeated tillage effective	Reduce seed production if mow at bud stage; no plant control	No biocontrol agents available
Tamarisk[2]	Can be dug or pulled with mechanical equipment – difficult to remove	Tillage not effective	Re-sprouts when cut with mower	*Diorhabda elongate* – for availability contact Gary Adams APHIS 406-449-5210
Tansy ragwort[2]	Individual plants can be removed by hand-digging; remove entire crown	Repeated tillage effective	Reduce seed production if mow at bud stage; no plant control	3 biocontrol agents available; Cinnabar moth most effective
Thistle, Canada	Stops seed production, will not control plant	Tillage will spread root fragments	Must mow 2 X/year to obtain limited plant control; can reduce seed production if mowed at bud stage	4 biocontrol agents available; minimal impact on Canada thistle in Montana
Toadflax – Dalmatian	Effective on small infestations; must be done for 5-6 consecutive years.	Dalmatian- Must be repeated every 7 to 10 days for 2 yrs to be effective;	Reduce seed production if mow at bud stage; no plant control	5 biocontrol agents available; *Mecinus* stem mining weevil most effective
Toadflax - yellow	Must remove all root fragments; must be done for 5-6 consecutive yrs.	Not effective on yellow toadflax – will spread root fragments	Reduce seed production if mow at bud stage; no plant control	5 biocontrol agents available
Whitetop (hoary cress)	Somewhat effective on newly established plants; must pull for 4 consecutive years	Tillage will spread root fragments	Reduce seed production if mow at bud stage; no plant control	No biocontrol agents available
Yellowflag iris[1]	Very difficult to remove, must dig and remove entire root	Tillage not effective	Reduce seed production if mow at bud stage; no plant control	No biocontrol agents available
Yellow starthistle[1]	Hand pulling effective on small, scattered infestations; remove 3" of root crown	Controlled by tillage	Reduce seed production if mow at bud stage	Biocontrol agents available; no ac currently in MT - biocontrol agents not suitable as control

[1] Indicates weeds that are either in Category 3 (not currently present in the state) or Category 2 weeds occupying <1000 acres in Montana. Highest priority for complete control of infestations. Report new infestations to Montana Department of Agriculture.
[2] Indicates Category 2 weeds occupying >1000 acres in Montana. Priority for containment and control as resources allow. Report new infestations to Montana Department of Agriculture.
[3] Information on biological control agents can be found in "Biological Control of Invasive Plants in the United States". 2004. Ed. E.M. Coombs, J.K. Clark, G.L. Piper, and A.F. Cofrancesco, Jr. Oregon State Univ. Press.

APPENDIX N. CONSIDERATIONS FOR SEEDING

Time and patience are required to establish healthy, weed resistant plant communities. Setting realistic goals and addressing the economic and biological feasibility of the project will determine success or failure of any revegetation project. Numerous grasses, forbs, and shrubs are available for revegetation projects. Consult the following references for information on seed availability, seeding rates, and habitat requirements:

- FWP Habitat Bureau, Helena, MT.
- Holzworth et al. 2003. Dryland Pastures in Montana and Wyoming. Montana State University Extension Publication EB19.
- Goodwin et al. 2006. Revegetation Guidelines for Western Montana: Considering Invasive Weeds. Montana State University Extension Publication. EB 170.
- Source Guide for Native Plants of Montana, published by the Montana Native Plant Society at www.umt.edu/mnps/mnpspubs.htm.
- USDA, Natural Resource Conservation Service, Bridger Plant Materials Center. 406-622-3579.

Following are a few considerations for seeding desirable species adapted from USFS, Region 1: Native Plant Handbook

Seed Quality: Be sure to know the origin of seed used in a project. Seed purchased commercially should have an analysis label that states the following:

Species or variety of seed.

Purity: The amount of material in a bag that is the seed. The rest is inert matter, weed seed, or other seed. Most seed should be no less than 75% pure, and preferably over 85% pure.

Weed Seed Content: The tag should state that NO noxious weeds are present. Only certified weed seed-free seed be used.

Germination: The higher the germination the better. Germination should not be less than 65% for most species, although some shrubs and forbs will have less. Total germination may be followed by (TZ) which means that a staining technique using tetrazolium chloride was used to evaluate the viability rather than a true germination test. This is generally accepted as a substitute for an actual test. Be sure to look at the germination test date. If it is over a year old, expect to get lower germination. Seed must be stored properly to retain its viability. If stored improperly, viability can decrease rapidly.

Pure Live Seed (PLS): Most species are sold on a PLS basis. Calculations for seeding rates (see example below) should be done on a PLS rate, rather on Lbs per acre. PLS is simply the percent purity multiplied by the percent germination (% purity x % germination).

How to use PLS: If the plan calls for so many lbs of PLS per acre, how much bulk seed is needed? To calculate this amount, divide the PLS percentage into the number of pounds recommended.

Example: You want to plant 5 lbs of Idaho Fescue per acre. The analysis label indicates 85% purity and the germination is 79%.

.85 x .79 = .67 PLS.

Divide .67 into 5 lbs/acre = 7.5 lbs of BULK seed/acre.

Time of seeding: Seeding should be done when there is adequate moisture to assure seedling establishment. Generally this is in the early spring or late fall. It is best to get recommendations from MSU Cooperative Extension Service for seeding dates that will ensure the greatest chance of success for your local project area. In general, if you plan a spring seeding, seed early enough to take advantage of early spring moisture and cool temperatures. Spring seedlings are often unsuccessful because seeding may be delayed if excess soil moisture prevents equipment from accessing the project site. When the equipment can get into the site, it may be too late for optimum seedling establishment. Fall seeding needs to occur late enough so that germination does not occur until the following spring.

Seedbed preparation: The best seedbed is firm, fine, moist, and free from excessive competition. It is extremely important to have a firm seedbed to reduce air space and ensure that germinating seed contacts moist soil. Seed placed on hard seedbeds where there is high competition from existing plants will generally fail. If topsoil is present, leave it in a roughened condition. Subsoiling or chiseling may be necessary to break up hard subsoil layers. Use of soil cultivators that decrease soil compaction can be very beneficial, as opposed to backhoes or rippers that can just breakup the surface soil, leaving compacted soil layers underneath. If soil crusting has occurred on the surface soils prior to seeding, the crusting must be broken up and the application of a mulch and tackifier should be utilized. If rainfall has occurred on disturbed areas prior to seeding, crusting has probably occurred.

Stockpiling organic material and topsoil during construction activities for redistribution later is critical. One of the biggest problems on roadside restoration projects is the lack of organic matter and nutrients needed by the plants. Sampling soil pH, bulk densities, and nutrient levels present on and in the seedbed will provide information to help decide if soil amendments, mulches, fertilizers, or other cultural treatments are necessary.

Seeding rates: The following is an example of seeding calculation.

Revegetation and Stabilization of Disturbed Areas - Grass/Forb/Shrub Mix LBS. PLS/ACRE [1]

Species	**% PLS**	**Seeds/Lb.**	**Seeds per sq. ft**	**Sow Rate Lbs./acre**
Grass A	80	150,000	14	5.0
Grass B	76	572,500	40	4.0
Grass C	89	241,000	10	2.0
Forb A	80	4,124,000	19	.25
Forb B	70	286,000	5	1.0
Forb C	80	30,000	3	5.0
Shrub A	65	4,000	.1	2.0
Shrub B	70	356,000	.5	.1
Total				19.35

[1] Rates for broadcast seeding. Target rate is for 75 – 125 seeds/sq. ft. with grass/forb/shrub mixes.
% PLS = % Purity x % Germination
Seeds per square foot = Seeds/Lb. x % PLS x recommended lbs./acre x 1/43560.
Lbs./acre = target seed/ft x 43560 sq. ft./acre x 1/(seed/lb. x PLS).

REMEMBER: Increasing seeding rate will NOT make up for poor seedbed preparation, harsh sites, poor seeding methods, or improper timing of seeding. Follow the recommended seed species, rates, and time of seeding for your local project area. In general, PLS per sq. ft. targets need to be determined by a restoration ecologist or botanist. For dry sites PLS/sq. ft. rates will be lower than very wet areas.

APPENDIX O. WEED TREATMENT EFFECTIVENESS MONITORING FORM

Inspection Information:					
Monitoring Date:	**Name(s) of person collecting data:**				
Site Information (location; landform; type of site)					
General Treatment Information					
Treatment Date	**Target species**	**Treatment**	**Rate**		**Weed Growth Stage**
Criteria:			**Yes**	**No**	**Comments/Notes**
Was the weed population adequately suppressed?					
Was the planned procedure used, if not, why did it vary from the original plan?					
Were weed management costs equal to or less than projected costs?					
Was the target weed killed (no re-growth present) ?					
Were there any side-effects to non-target plants from the treatment?					
Should the treatment be repeated or modified?					
Was funding and manpower available at the appropriate time and were they adequate?					
Was personnel training adequate?					
Were additional problem areas identified?					
Additional Notes and Comments (Use back of form if needed):					